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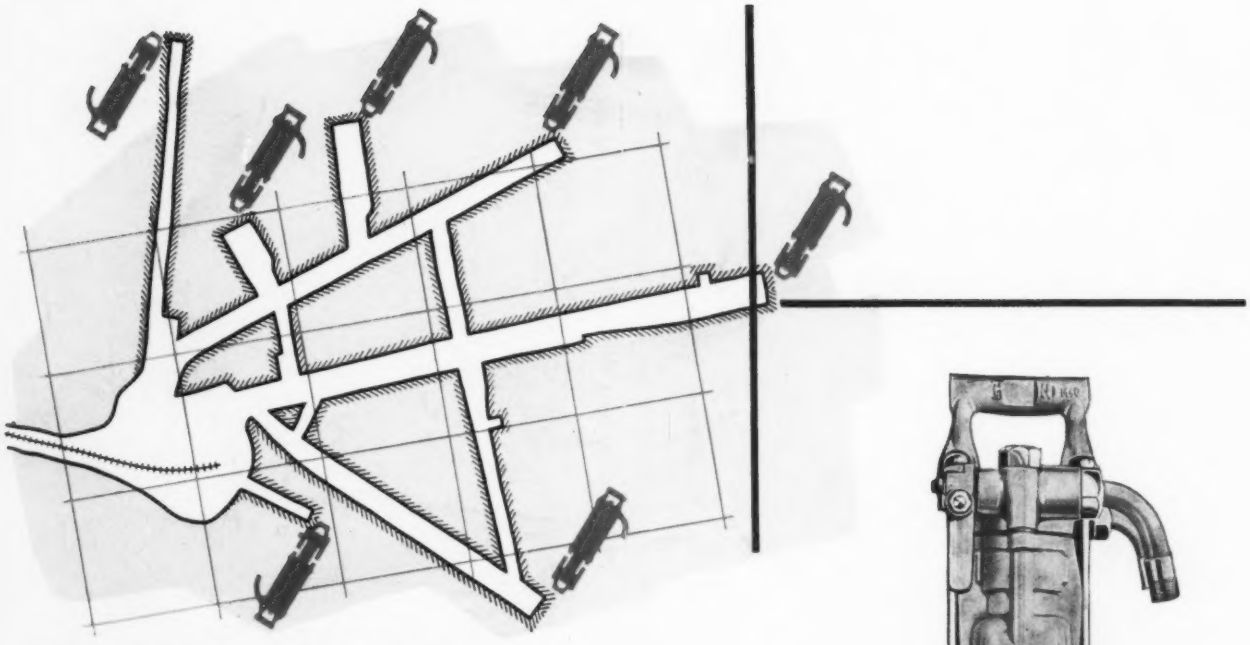

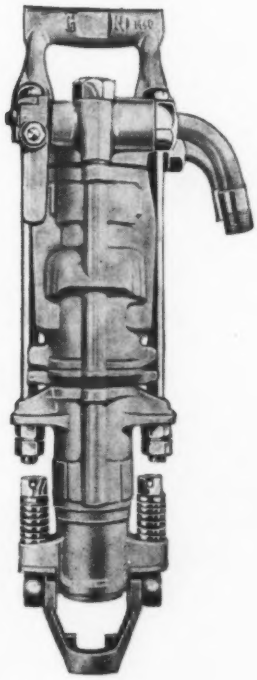

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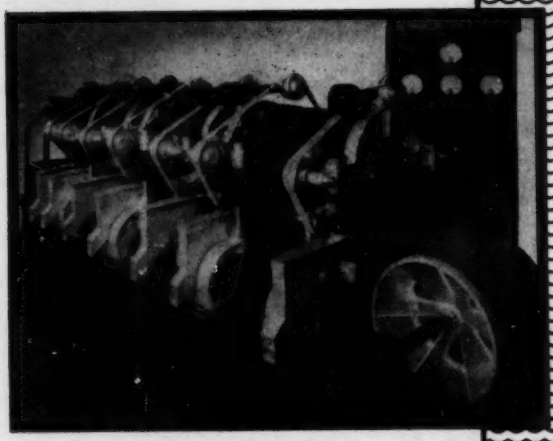
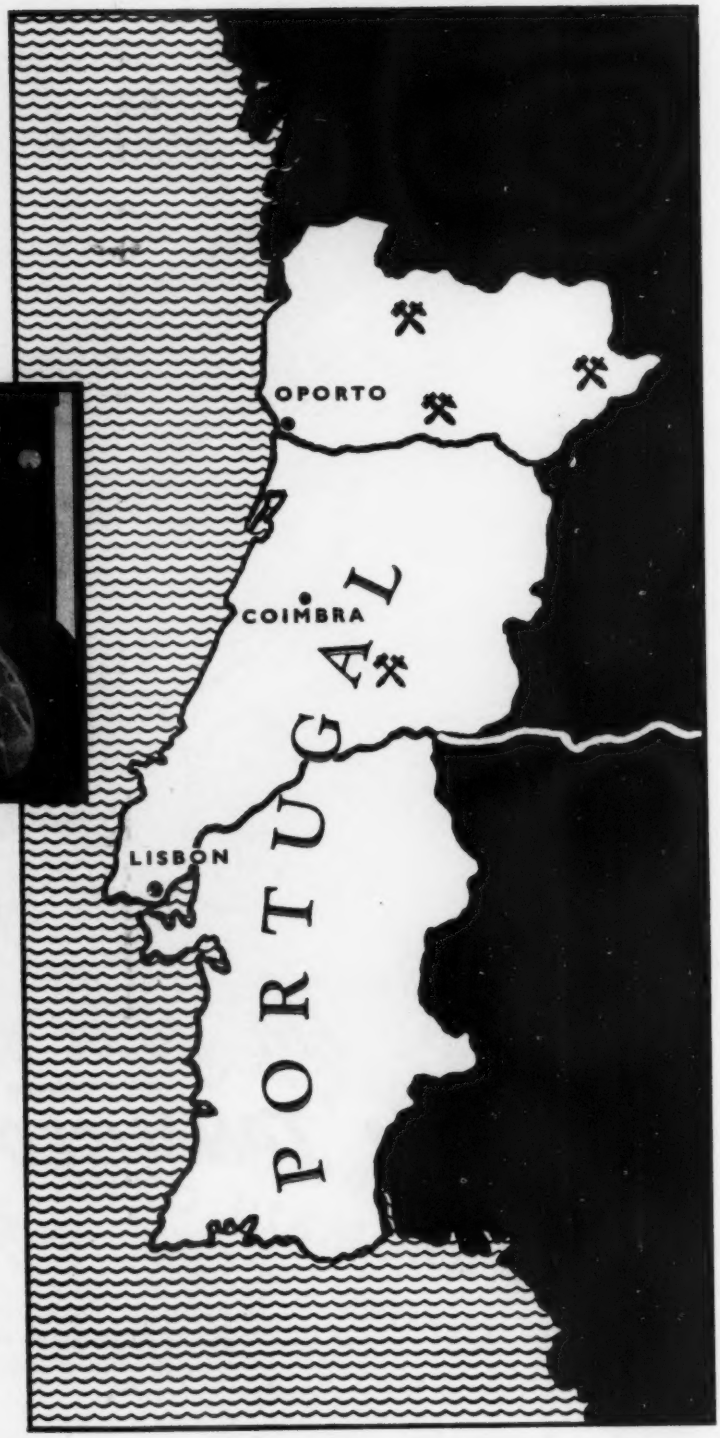
Magnetic separation of wolfram in PORTUGAL





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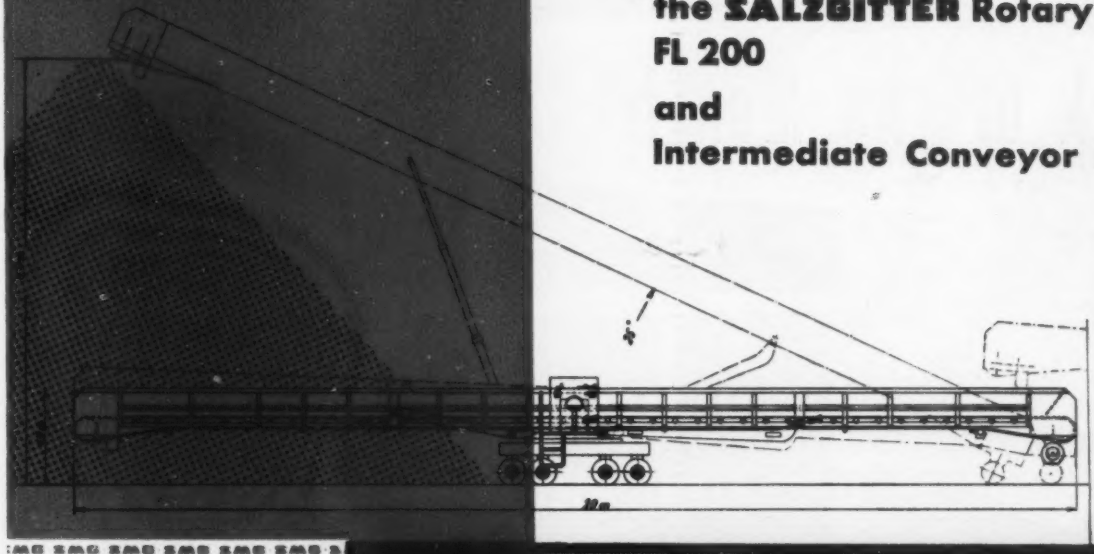

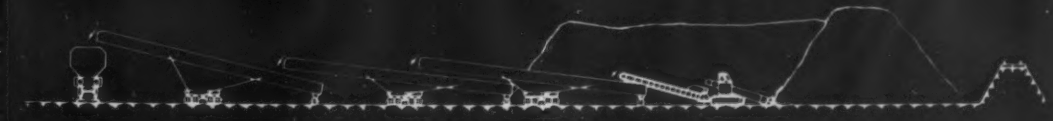

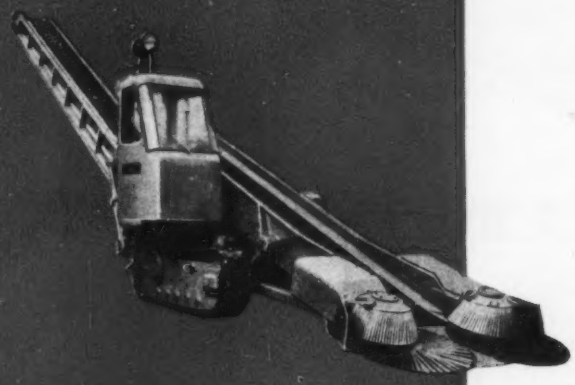

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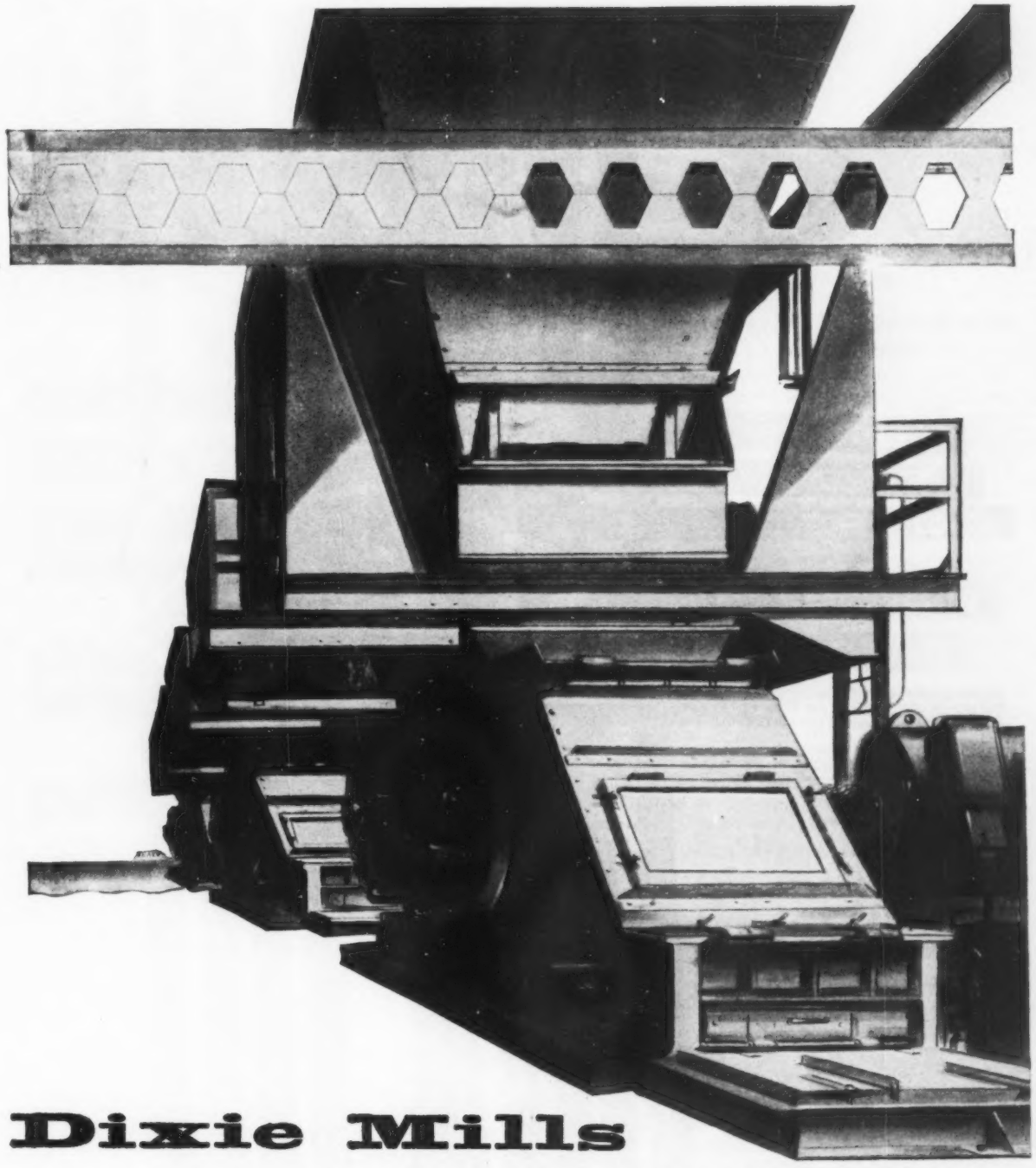

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The Mining Journal

London, April 4, 1958

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Commonwealth Mineral Resources Plan ?

THIS week has seen the publication of the first and major section of the Commonwealth Economic Committee's *Review of Commonwealth Raw Materials*. A further instalment is to follow dealing in detail with individual territories, but meanwhile this first volume gives us the overall picture which has long been promised us. Although the review deals with organic raw materials as well as metals and minerals, it is only the latter which need concern us here.

Now that the review has arrived, what have we got ? It must be said, at once, that the review is in no sense a Paley report brought up to date. It is purely an historical document covering in the main the seven-year post-war period from 1949 to 1955, against a comparative background of the pre-war period which has generally been taken as the average for the years 1935-1937. To us the two significant facts about the very considerable labour which this review represents are, first, that all the indications are that we have here a comprehensive record of the supply-demand picture up to the end of 1955 (although nothing is said about probable ore reserves or future demand), and secondly, that of itself such a record is of very little use. It is clear from the report that the Commonwealth Economic Committee is itself very much alive to this latter point as one of its principal recommendations is that it should be authorized to make arrangements for keeping the material covered by the review progressively up to date.

It is a pity that the Committee could not go further and put forward proposals as to how the whole problem of establishing a Commonwealth mineral resources policy should be tackled, as obviously the publication of this first report (as well as the proposal that the machinery which was used to compile it should be perpetuated) can only be justified on the assumption that this effort is going to be put to constructive use.

Certainly, a mineral resources policy is no less urgently needed now because we happen to be in a period of recession, than it was during the period of the post-Korean shortages. Disregarding short-term trends, the inescapable fact is that the world's rising population, superimposed upon sharply rising standards of living in the underdeveloped areas of the world no less than in the industrialized countries, is in the long term going severely to tax the world's mineral resources. Side by side with this, we have a production situation in which the United States is becoming increasingly a " have-not " country for the majority of the minerals she consumes. It is, therefore, the rest of the world (and more especially the Commonwealth countries) which are going to have to expand mineral production to meet the growing demand from the Free World and very likely from the Iron Curtain countries too.

Not only, therefore, is it going to be necessary to plan for a substantial increase in Commonwealth mineral production but, as we have already seen during recent periods of shortage, it is going to be very necessary for the Commonwealth to secure control over the destination of this increasing output. Today the markets

in, for example, columbium, lithium or cobalt, may not seem to bear out this view but it is only necessary to think back over the events of recent years to realize the need for ensuring the availability of these metals for Commonwealth users in the next squeeze. This is not to say that we should not seek to maximize our dollar exports but merely that a first priority is ensuring raw material supplies for the industries which must grow up throughout the Commonwealth

Obviously this problem cannot be examined without adequate data. First, we must have a continuously up-to-date statistical service supplying trends in production, consumption and stocks. The essential here is that they should be intelligent estimates of the immediate position rather than completely accurate historical records of the position as it was a year or two years back.

Practically all metal markets are world markets, consequently these figures must be presented on a world basis to have any meaning. The figures published by the International Tin Council are a model in this respect and it was also heartening to find the British Bureau of Non-Ferrous Metal Statistics making available early in March a good statistical assessment of the copper position up to the end of 1957. Global figures of this sort, published with any promptitude are, however, still the exception.

The next requirement is the compilation and maintenance of a progressive picture of the Commonwealth's economic mineral deposits, so that it is possible to assess the Commonwealth's production potential at various periods in the future given certain assumptions regarding market price. This information we must then be able to relate to the probable trend in production in other parts of the world and to equate this with the probable growth in world consumption.

The Paley Report, notwithstanding its shortcomings, has been invaluable in showing what can be achieved in this respect in a very short space of time. The significant thing about Paley is not that when it first appeared it was widely held to be extravagant in its estimates of future requirements nor that in the light of subsequent events it appears rather to have been conservative in these estimates. The essential point is that it provided, however imperfectly, the basic data on which to plan, and also provided a rough yardstick by which to measure performance.

Paley, however, was no more than a photograph of the world's minerals picture and prospects taken at a moment in time, and an incomplete one at that, so far as concerns the non-American world. What is needed is a continuing record.

It is obvious that we have not at present in the Commonwealth any one organization equipped to provide some future Commonwealth conference on minerals policy with the data on which to plan. A great deal of useful work is being done both in the public and private sectors of the economy but it is largely unco-ordinated. A first essential, therefore, of any planning at Commonwealth level must be to bring some order into this situation. This does not mean superimposing some new statistical agency on top of what already exists, but rather seeking to get the best out of what there is, eliminating the considerable duplication of effort which exists and stimulating the production of the data which is at present lacking—and a great deal is lacking.

It is devoutly to be hoped that before the next Commonwealth conference considerations of these major policy problems will have been stimulated by the Commonwealth economic Committee's latest publication, and will lead to their examination by the Commonwealth governments, so that out of the conference may at least emerge a working party with the authority, technical competence and resources to prepare a practical programme of action.

THE MALAYAN TIN PICTURE

In the table at the bottom of this page we summarize the performance of the Malayan tin industry last year. The large quantity of tin-in-concentrates held in stocks at the end of 1957 was occasioned by a strike at the Penang smelter.

The fall in production in 1957 is some indication of the progressive deterioration in the average tin content of mining lands currently being worked in Malaya. This stresses the urgency of the need for extensive prospecting and for a more enlightened attitude of State Governments, some of which show a marked reluctance in granting leases of land for mining, even going so far as blanketing known economic values by leasing the area for other long-term land uses.

The following table exemplifies the changing production pattern consequent on the decline in average recoverable alluvial ore values.

Method	*Operating Units*			*Proportion of Production*		
	1955	1956	1957	1955 %	1956 %	1957 %
Dredging ...	79	79	77	50.69	49.29	47.42
Gravel Pumping	602	636	599	39.18	40.03	41.15
Hydraulicking	16	14	13	2.20	2.36	2.75
Open Cast ...	5	4	4	2.01	2.20	2.12
Underground ...	11	26	25	3.66	3.85	4.25
Other Mines ...	44	29	25	0.48	0.50	0.50
Dulang (Pan) ...	—	—	—	1.78	1.77	1.81
Totals ...	757	788	743	100.00	100.00	100.00

The above table shows that whilst the costly and quasi-permanent dredging installations have produced a steadily declining percentage of total annual output, the ratio of the cheaper and more mobile gravel pump mines has equally steadily improved.

The Chief Inspector of Mines, in his bulletin of statistics for the fourth quarter of 1957, observed that there were eight more tin mining units at work at the end of the quarter than there were at the end of the third quarter, " the increase representing an endeavour to be in on the quota ".

Considerable attention has in recent years been given to improving the efficiency of ore treatment plants. There is an increasing use by the larger producers of magnetic separation and flotation methods. Many gravel pump proprietors are now using jigs where previously they relied entirely on gravity sluicing. The great advance in the efficiency of recovery methods has enabled some dredges to be kept in production by re-dredging through tailings of old workings, in the absence of available virgin ground. Economic recoveries have been obtained.

With the coming into force of controlled exports of tin, attention is focused on the export figures, which so far as the Federation of Malaya is concerned, is defined in the

MALAYAN TIN STATISTICS
(l.tons)

	1955	*1956*	*1957*
Tin-in-concentrates			
Production	61,244	62,295	59,293
Imports	11,303	11,404	14,717
Tin Metal			
Production	70,632	73,263	71,289
Exports	71,161	73,275	70,600
Stocks at year end			
Tin-in-concentrates ...	4,871	4,793	6,960
Tin Metal	2,214	2,193	2,830
Total Stocks	7,085	6,986	9,790

International Tin Agreement as the transfer outside the Principal Customs Area. As the three Malayan smelters are specifically excluded from the Principal Customs area and there are no direct foreign exports of tin concentrates, exports for the purposes of the Agreement means deliveries of tin in concentrates to the smelters. These are termed "deliveries", to distinguish them from tin metal exported by the smelters, which latter includes tin metal smelted from tin concentrates imported from Thailand, Burma and other countries. The product of such imported concentrates is included in the metal shown in tin metal exported from Malaya. The Federation's Tin Export Duty is levied on "deliveries".

It is relevant to mention here that the Singapore tin market makes sales based on the quantity of tin in concentrates notified by the smelters as being available for conversion into tin metal on a sixty-day forward shipment date. Thus, generally, deliveries will not appear in tin metal export figures until about sixty days after the concentrates have passed through the customs control.

Second quota period (April 1 to June 30) permissible exports of tin metal have been fixed at 8,625 tons by the International Tin Council. This total is equivalent to 192,686 piculs of tin concentrates and represents 58.19 per cent of the 1957 quarterly average production of 14,823 tons of metal content. To correct overfill this amount has been reduced to 180,000 piculs.

A breakdown of the whole shows that European producers have been allocated 105,588 piculs, Asians 71,190 piculs, with the remainder allocated to Dulang production. Revised quotas in the first period were 219,748 piculs for European and 150,686 piculs for Asian producers.

THE FUTURE OF POTASH

The huge expansion programmes upon which U.S. potash producers have embarked in recent months have raised output capacity to some 2,500,000 tons a year—a production double the Carlsbad, New Mexico, capacity of a decade ago and 20 per cent greater than present North American demand. The spectacular increase in requirements that was assumed as likely has so far completely failed to materialize. The current expansion programmes of the North American producers are thus faced with annual sales totalling a mere $80,000,000.

The list of potash producers of the North American area includes such names as International Minerals and Chemical Corporation, the British-owned U.S. Borax and Chemical Corporation, Freeport Sulphur and Phillips Petroleum. Last year National Potash Co., jointly owned by Pittsburgh Consolidation Coal Co. and Freeport, opened a new mine of 400,000 tons capacity at Carlsbad, and two other newcomers to the industry have large mines contemplated or in development in the same area.

In all, by 1938 North America was using about 500,000 tons of potash yearly, half of which was imported and the balance mined at Carlsbad. By the end of the Second World War U.S. consumption was 1,000,000 tons a year. It has since more than doubled.

By and large U.S. exports for the year ended May 31, 1957, totalled 236,532 tons compared with 103,523 tons the previous year. During this period U.S. producers of potash have been gaining a greater share of world markets, often at the expense of European competitors.

In recent years the most important world producers of potash have been Western and Eastern Germany, France, the United States and the Soviet Union, but Spain, Poland, Korea and Israel also have considerable deposits. In Western Germany production rose from 8,786,200 l.tons in 1950 to 15,853,000 l.tons in 1955 and 15,299,000 l.tons in 1956, while in the same period Eastern Germany increased its output of marketable product from 1,460,000 tons to 2,000,000 tons.

It is, however, in Saskatchewan, Canada, that the biggest drive to uncover new sources of potash is being carried on. The Canadian potash fields are estimated to cover some 3,000,000 acres, and reserves are currently estimated at 100,000,000,000 tons. New shafts are being sunk in Saskatchewan by Potash Co. of America and International Minerals and Chemical Corporation. Sixteen other companies are active in the 340-mile potash belt. During the next ten years Saskatchewan may well become the world's major potash producer.

In Israel the September, 1957, potash output at the Dead Sea plant reached a record 7,800 tons and an annual rate of 150,000 tons has been suggested as a production target. In Jordan a potash plant is to be rebuilt over the next five years at an estimated cost of reconstruction in the region of £4,000,000 to £4,500,000.

The World Bank has made a loan equivalent to £75,000,000 for development in Southern Italy. Of this sum, a substantial amount will be allocated to three companies for the exploitation of rich potash deposits that recently have been discovered in Sicily. These deposits may yet prove to be amongst the largest occurrences in the world. Three other provincial projects include the development of potash mines.

Viewing the situation as a whole, despite the rapid expansion of production and the highly competitive conditions now prevailing, long-term prospects for the potash industry may be regarded as excellent. It would thus seem that the long-term outlook is encouraging, as over a long period demand has been increasing at an annual rate of 6 per cent.

HEALTH FOR COLOMBIAN MINING

Colombia's chief mineral deposits are platinum, gold, silver, coal, oil and emeralds.

In 1956, 26,215 oz. of platinum were produced by the river dredging operations of the Canadian company, Choco Pacifico Ltd. Gold production fell to 245,589 oz. in January-September, 1957, from 438,437 oz. in 1956, the output being dredged in several provinces by Pato Consolidated Gold Dredging Ltd., Frontino Gold Mining Ltd. in Antioquia and by local companies in Caldas.

According to studies made by the Institute de Fomento Industrial, Colombia has proved reserves of coal totalling 212,000,000 tonnes. Several foreign companies are interested in the El Cerrejon deposits and attention is being paid to the resources of the Cauca Valley. Iron ore occurs throughout the country and is exploited by Siderurgica Paz del Rio de Province Bozaca.

Other mineral occurrences include copper, pyrites, sulphur, muscovite, biotite, galena, sphalerite, pyrolusite, asbestos, kaolin, barytes and rutile. Some of these may occur abundantly. Nickel, lead and aluminium may yet be produced in Colombia by foreign companies, while Compania de Uranio hopes to begin commercial production of uranium by the middle of this year from the Santander mines.

The tone of legislation, both existing and drafted, indicates that the Colombian Government regards the establishment of a healthy mineral industry as a major step towards a more balanced national economy.

MULTI-ROPE WINDING—I

Multi-rope Winding from Deep Levels

THE first consideration when designing this new winding system was to provide for all conditions of operation, including suitability for use when sinking either as a double drum winder or as two single drums—whichever might be preferred by the sinking crew. Under either condition, it should be possible for the winder to be installed in its permanent position with the centre of each drum lined up with the centre of the compartment it will finally serve. It should further be possible for each drum to be fitted with two brake paths with no alteration to drum centres.

By having an independent gear for each drum and a centre pinion for spacing, the winder can be operated by one, two, or three motors, whichever is most suitable to meet the requirements of the mine.

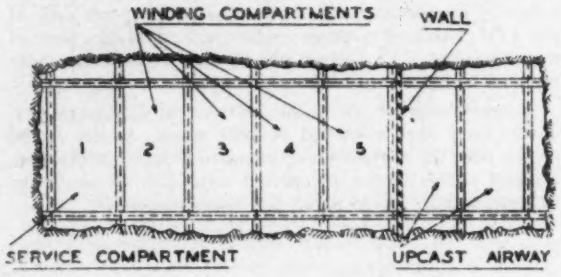
With this arrangment, should it be decided to sink with two single drums, the driver's platform and portions of the electrical control equipment can be duplicated and the centre pinion of the winder removed, leaving two single drum units of exactly the same construction. On completion of sinking operations, by inserting the centre pinion, the winder can be commissioned for full double drum duty. Naturally, if the decision is to sink with double drum winding, no change in this portion of the winder is necessary.

By having the two drums lined up with the compartment centres it is obvious that the fleeting angle of ropes is reduced to a minimum, so that the winder can be placed closer to the shaft centre line if so desired.

During the sinking period only one rope need be used on each drum, and the full width of the undivided drum is then available for rope storage. This reduces the number of layers and obviates a considerable amount of the difficulty, experienced during the early stages of sinking, which is caused by slack rope when the sinking bucket rests on the shaft bottom.

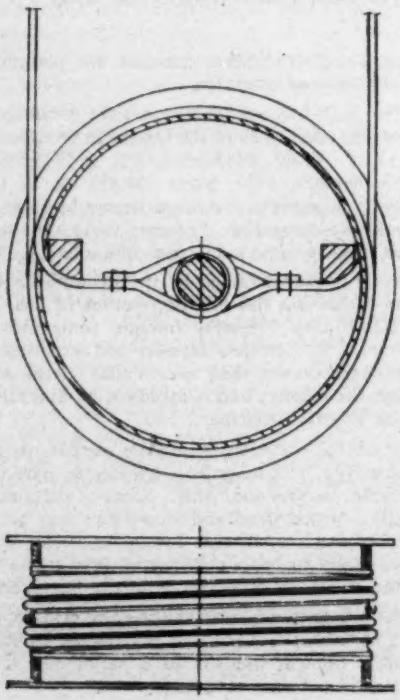
There would be a single headframe sheave positioned in the centre of each compartment during the sinking period. Then, on completion, a second sheave could be installed at the correct centres, providing facilities for twin ropes. At this stage the division plate would be fitted to each drum, to complete the multi-rope winder.

It is illustrated how the drums are divided by the division plates already referred to, and it can be observed that the two rope lead-in ports in the drum tread are so positioned that the two winding ropes are spaced to have exactly the same number of turns per layer on each section; therefore the ropes when coiling correctly will remain the same distance apart at all times during the wind.



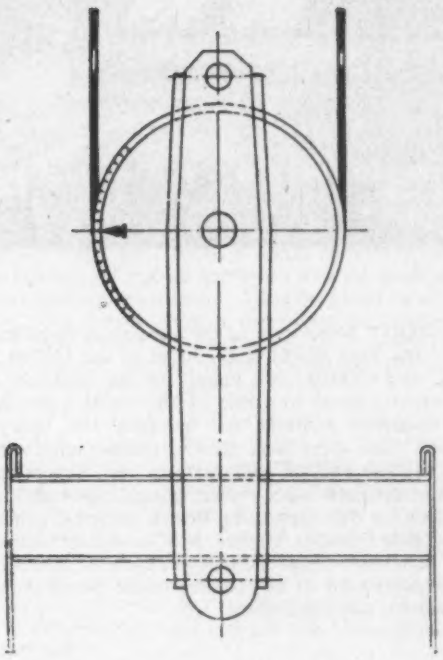
The spacing of the two sheaves in the headframe is such that it will match up with the diameter of the compensating device on the conveyance, thus ensuring that both ropes will be parallel to each other when operating at any point in the shaft. The diameter of the compensating device will be determined by the compartment size and end-loading on each pair of ropes.

The compensating device on the conveyance is essential with multi-rope multi-layer drum winding to ensure equal tension on both ropes at all times, and it must include sufficient rope capacity to cater for any unforeseen condition that may arise. As there are two independent ropes which are attached separately to the compensating device,



Above is shown one disadvantage of the Koepe system in that should flooding of a shaft be encountered, the winding plant cannot be used when de-watering as there are no facilities for clutching. For the same reason an accident in either compartment renders the equipment unserviceable. Illustration shows the position of the service compartment and the four dual-purpose winding compartments of a shaft in the O.F.S. where a diesel locomotive fell from surface down the No. 3 compartment when conveyance in that compartment was descending, resulting in the steel dividers between Nos. 2-3 and 3-4 compartments being distorted. The winder serving Nos. 4-5 compartments was of the double-drum type and could be uncluitched. At left are two independent ropes attached separately to the compensating device

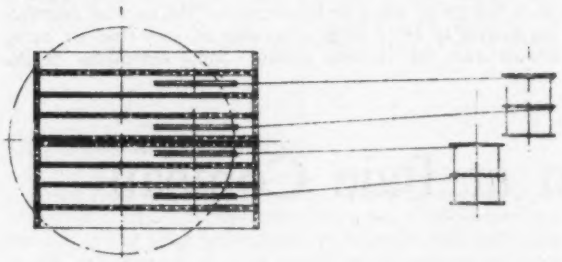
Right, the pointer will indicate zero when set correctly with ropes coiled properly on the drum and the conveyance at surface. Below, drums divided by division plates



the ends are available for cutting at intervals for test, thereby complying with the Mines and Works Regulations.

If two ropes are of exactly the same diameter and are fitted to the same drum they will travel through the shaft with no relative movement of one to the other, but should there be a slight difference in diameter, one rope will travel slightly faster than the other and the compensating device must take care of this condition to maintain equal tension. The device, therefore, must be free to rotate at all times.

A further condition to provide for is faulty coiling on drums. Should this occur during the wind and one rope mount a layer prior to the other, there will be a considerable amount of variation in rope travel and, assuming the ropes were 1½ in. in diameter, the difference in travel of



one compared with the other would amount to approximately 9.4 in. per turn of drum; although the winder is designed in such a manner that the safety circuit would be opened immediately faulty coiling occurred, provision must be made to meet such an abnormal condition while the winder is brought to rest under normal deceleration. Assuming the deceleration period represents twelve turns of the drum from full-speed to rest, then one rope, travelling 9.4 in. per turn in excess of the other, would have travelled a distance of 113 in.; therefore, there must be sufficient spare rope in excess of this amount on the compensating device to meet the demand.

A most important feature of the designed compensating device is that it is provided with an indicator pointer, which at all times will indicate movement. This pointer, when set correctly with ropes coiled properly on the drum and the conveyance at surface, will indicate zero. If both ropes during their life, wear and stretch by the same amount it will remain on zero setting, but should one rope for any reason deteriorate more than the other and cause elongation, this amount, however small, will be indicated on the scale. As most defects, whether they be broken wires or corrosion, cause additional elongation, deterioration of a rope will be detected at the daily examination. If the pointer moves in a clockwise direction the faulty rope would be on the right-hand side and, if anti-clockwise, on the left.

At this stage of the design the author was of the opinion that provision had been made to guard against all abnormal conditions. However, it subsequently became apparent that it would be an added advantage if provision could be made for the very worst condition of all—that is, in the event of a broken rope, to arrest and transfer the load without shock from two ropes to one.

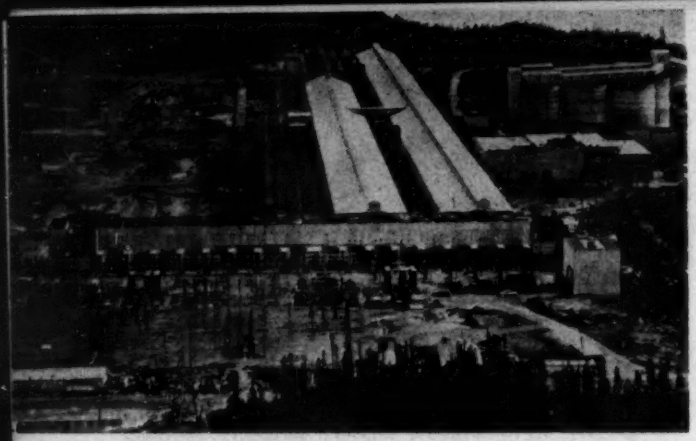
As mentioned previously, the compensating device has to be free to rotate to ensure equal tension at all times. This means that, should one rope break, it would spin freely and the other rope would immediately be broken by the shock. Therefore, an additional feature was investigated to ensure that, should this condition arise, the rotation would be arrested and the load transferred to one rope with the shock reduced to a minimum.

During the investigation, many methods were considered, all of which failed, due to the necessity for requiring a free movement in excess of one revolution.

Then it became evident that the remedy was to add a brake to the device; this was immediately considered and found to provide the solution.

The final design, therefore, possesses this additional feature that while the device is free to compensate at all times to give equal tension should either rope break in any portion of the shaft, the load will be transferred with a minimum of shock to the remaining rope. This has been proved many times by actual full-scale tests and has never failed to operate satisfactorily.

A paper by R. Blair, M.I.Mech.E., M.S.A.I.Mech.E., in "Journal of the Institution of Certificated Engineers", Vol. 30, No. 6, South Africa, described a new type of drum-winder, designed to meet the requirements of deep-level mining with increased loading. The following article, the first of a series, is condensed from this paper. It is submitted that this multi-rope, multi-layer drum-winder provides in a double drum-winder all the advantages of Koepe or friction winders which hitherto were unobtainable in drum-winders.



Electrical Installation at Baie Comeau

ABOUT 70 per cent of the aluminium metal used by the Free World is produced in the United States and Canada, due mainly to the relatively cheap hydro-electric power available for the smelting process and good transport facilities for handling the bulky raw materials. The many large rectifier stations built to supply power to these potlines have hitherto been almost entirely American designed water-cooled, pumped ignitron installations, and for this reason the British electrical conversion plant at Baie Comeau, Quebec, is of particular interest. It is the first multi-anode pumpless air-cooled mercury arc rectifier equipment to be installed in the North American continent for this application.

The British Thomson-Houston Co. was entrusted with the design, manufacture and erection of the converting plant for this important joint British-Canadian project. The order BTH obtained early in 1956 for two 100,000 amp. 850 v. D.C. rectifier equipments for Baie Comeau was at that time the largest contract ever placed in the U.K. for mercury arc rectifier equipment.

Power for the Smelter

Power for the smelter plant is supplied from the Manicouagan power station over approximately 11 miles of two-circuit transmission line to the duplicate 161-kV. site busbars. Each rectifier equipment feeding one potline is then supplied through a step-down transformer and regulating transformer through the variable intermediate voltage busbars to which the rectifier transformers are connected. A duplicate standby intermediate voltage busbar system is supplied from separate standby step-down and regulating transformers. The rectifier plant supplied includes the 33-kV. intermediate voltage switchgear as well as the power factor correction installation and the oil handling equipment for the site.

Each rectifier equipment supplying direct current to one potline comprises eight units, each rated at 12,150 kW. 14,300 amp. which enables the full load requirement of 100,000 amp. D.C. at 850 v. to be supplied on any seven units, i.e., with one unit out of service.

Small adjustment of D.C. voltage between tappings on the regulating transformer and reduction to zero voltage for short periods, which is occasionally required in the operation of the potline, is achieved by grid control of the rectifiers. The rectifier transformers for this installation are among the highest rated of their type in service. A separate phase shift transformer is mounted in each rectifier transformer tank to provide 48-phase operation of each rectifier equipment when all eight units are in service.

The 144 mercury arc rectifiers supplying each potline are of the standard BTH pumpless air-cooled steel tank design, mounted on withdrawable trucks and enclosed in folded sheet steel cubicles. Thus all equipment situated in the main rectifier room and operating at 850 v. is completely enclosed but ready access is provided for inspection and cleaning. This is a feature not generally provided in previous installations in North America, and in addition to the greater safety afforded to the operating personnel the arrangement undoubtedly improves the appearance of the station.

Problems of Climate

The severe icing and cold weather conditions which occur during winter months at Baie Comeau introduced additional problems in the design of the A.C. switchyard and the ventilating system of the rectifier building. Water cooling of equipment has been avoided and special measures have had to be taken in the design of the rectifier ventilating system to avoid large quantities of very cold air being drawn over the rectifier tanks. Some indication of the magnitude of this problem is illustrated by the fact that during the early construction stage of the project in January, 1957, the ice build-up on overhead conductors amounted to ½ in. and temperatures of minus 40 deg. F. were recorded.

The successful commissioning of the electrical conversion plant ahead of schedule has only been achieved by close liaison and cordial relations between the British manufacturers, Canadian contractors and the Canadian-British Aluminium Co. Construction of the second rectifier equipment is already well advanced and it is expected that this will also be ready for commissioning ahead of schedule during the second half of 1958.

The necessity to ship all equipment to Baie Comeau by sea in vessels sailing up the St. Lawrence River *en route* for Montreal has demanded unusually careful planning of the project to ensure materials being ready for shipping to site during the eight months of the year when the St. Lawrence River is open to ocean-going shipping.

The recent announcement by Canadian British Aluminium Co. of the pouring of the first aluminium ingot at Baie Comeau in Eastern Quebec, marks the completion of the first stage of a large-scale engineering achievement. The new development results from the entry into North America of the British Aluminium Co., who, in partnership with the Quebec North Shore Paper Co., formed the Canadian British Aluminium Co. in 1955. The illustration shows the Canadian British Aluminium Co.'s smelter plant at Baie Comeau. The rectifier house is the long building at the far side of the switchyard.

Minerals for Glass Manufacture

TWO basic raw materials are needed for glass manufacture and the provision of the first of these—silica sand—presents one of the earliest examples of man exploiting the minerals of the earth's crust, for the history of glass manufacture extends over at least 4,000 years.

For use with this sand some sort of alkali has always been required and this was in the past obtained (as sodium or potassium carbonate), from the ashes of burnt seaweed or plants. Today soda ash is commonly made by the Solvay Process but in several parts of the world a naturally-occurring soda is recovered for glass-making. Most of this natural product is trona, sodium sesquicarbonate, occurrences of the ordinary carbonate, natron, being much rarer. Deposits of trona occur widely in the desert areas of the Cordilleran region and Central Asia where they are derived from the evaporation of natural soda lakes. Commercial exploitation has been attempted in California, Wyoming and Nevada and also in the Magadi Lake area of Kenya. Lake Magadi is situated in the Rift Valley and the Magadi Soda Co. Ltd. is the largest single producer in Kenya. The Colony produced 146,326 tons of soda ash in 1956.

Oxides For Glass Manufacture

Apart from the two basic materials mentioned above an extensive range of oxides is used in glass manufacture and the art of the glass technologist is brought fully into play in the introduction of these minor constituents to produce a glass with the properties desired. The development of a commercial glass is essentially a study of the effects of the substitution of different oxides in the oxide mixture. Some of the additive materials, such as manganese, arsenic and selenium, act as decolorizing agents and are known as glassmakers' soaps, whilst oxides of cobalt, copper and many other metals are used to produce coloured glasses. Calcium, barium, magnesium and zinc oxides are also used whilst lead as red lead or litharge enters into the manufacture of lead glasses. Quantities of high-lead glass are now being produced for nuclear application in which they give good radiation shielding; 2 - 3,000 tons of lead oxide are consumed annually by the British glass industry. In the normal production of commercial glasses, however, there are, of the materials which are very commonly employed, several which are used in mineral form. It is these materials, the use of which in the glass industry may be of interest to the mineral engineer, which are included in the brief survey below.

Silica makes up some 50 per cent to 75 per cent of normal commercial glasses although heat-resistant glassware contains 80 per cent silica and there are certain special glasses containing over 96 per cent SiO_2. On the other hand, there are also glasses for specialized use containing less than 2 per cent silica.

Silica is introduced into the batch, as the raw material mixture for glass manufacture is termed, in the form of silica sand. A sand for glass manufacture should be high in silica content and low in iron, the ideal glass-making sand would, therefore, be one containing 100 per cent silica. Sands of 99 per cent silica content and over occur both in the U.K. and on the Continent where exceptionally pure sands are found at Fontainebleau in France and in Belgium. The modern trend towards mechanized operations, together with the depletion of the higher grade deposits, has meant in general a lower grade product which has subsequently to be upgraded by physical and chemical means.

Typical practice for the recovery of silica sands in this country is to remove overburden using scrapers and to win the sands using excavators, in some cases loosening the material first by explosives. Early selective methods practised in the U.K. have now been almost entirely replaced by highly mechanized mining operations and the grade of product has dropped accordingly. Modern plants have, therefore, to submit their product to various purification processes in which most of the common tools of the mineral dressing engineer are used. Over 1,000,000 tons of silica sand are recovered annually in the U.K.

Felspar. The felspar may be either a soda or a potash felspar, U.K. supplies being commonly obtained from Scandinavia, where Sweden and Norway produce about 75,000 tons annually. Commercial potash felspar typically contains 18 per cent alumina and costs about £13 per ton. In comparing the cost of alumina introduced as felspar with pure alumina cognizance must be taken of the fact that some 66 per cent of the material introduced is silica which would otherwise have to be provided as silica sand. Making this allowance the cost per ton Al_2O_3 introduced is still over £50.

Nepheline Syenite. A typical analysis of nepheline syenite as supplied for glass manufacture is : SiO_2 (60.4 per cent), Al_2O_3 (23.6 per cent), Fe_2O_3 (0.8 per cent), CaO (0.7 per cent), MgO (0.1 per cent), Na_2O (9.8 per cent), K_2O (4.6 per cent).

The only source of supply in the Western World is Canada where at Lakefield, Ontario, nepheline syenite occurs in a form readily acceptable to the glass industry. The original rock, consisting of a mixture of felspars and about 22 per cent by volume of the felspathoid nepheline, also contains about 2 per cent Fe_2O_3. The rock is mined by opencut methods and then crushed and dried. The dried product is milled to minus 30 mesh at which mesh the iron content can be reduced to 0.08 per cent Fe_2O_3 by magnetic separators, the as-mined content of 2 per cent Fe_2O_3 being detrimental for glass production purposes.

Nepheline syenite is available in the U.K. at about £20 per ton.

The Role of Alumina

Alumina is present in plate glass and many other commercial glasses to the extent of 2 per cent. Of the three materials used to introduce alumina into the melt and increase the mechanical strength of the glass, two are minerals and the third is an intermediate product of one of the largest metal industries. The two mineral forms, felspar and nepheline syenite, contain less than 25 per cent alumina and are gradually being substituted by alumina manufactured from bauxite either in the form of calcined alumina of 99 per cent purity or aluminium hydrate containing 65 per cent alumina and water.

Alumina production is an intermediate stage in the manufacture of aluminium metal from bauxite ores. Good grade bauxites contain over 50 per cent Al_2O_3 and various impurities. In the Bayer Process this raw material is digested with caustic soda in autoclaves and from the resultant solution aluminium hydrate is precipitated. The aluminium hydrate (Al_2O_3/H_2O) sludge obtained at this stage is filtered to recover caustic solution for process re-

circulation and it is at this point that some aluminium hydrate is obtained for various industrial uses such as the manufacture of abrasives and glass. Aluminium hydrate generally contains approximately 65 per cent Al_2O_3 but special hydrate (Al_2O_3/H_2O) containing 83 per cent alumina is also produced for use in glass production.

In the normal production of aluminium the hydrate is passed after filtration to rotary kilns where the water is driven off and calcined alumina (Al_2O_3) obtained for electrolytic reduction to aluminium metal. Some of this calcined product is also sold for use in glass production and the alumina is then added to the batch in virtually pure form. Calcined alumina usually contains about 99 per cent Al_2O_3 and minor quantities of various impurities. This is the cheapest manner in which to introduce alumina into glass. Alumina is produced at two plants in the British Isles and grades of both alumina and its hydrate with a low soda content are available for use in the production of special glasses.

The Lithium Minerals

Lithium. Lithium is extensively used in the manufacture of glass, decreasing the coefficient of expansion and increasing its strength. Lithium is a good opacifier and has been used in the making of translucent white glass for indirect lighting fixtures. It makes glass durable and is of advantage where high electrical resistance is required, such as in radio and television tubes. Lithium is introduced into the batch either as lithium carbonate or in mineral form.

All four of the economic lithium minerals, lepidolite, amblygonite, petalite and spodumene have been directly used as a source of lithium in glass production.

Spodumene $LiAl(Si_2O_3)_2$ has been used in the U.S.A. but there are many alternative demands for this mineral which contains 4 - 8 per cent Li_2O. The high iron content of spodumenes is prejudicial to their use in glass.

Amblygonite $Li(Al_2F)PO_4$ contains 7 - 9 per cent Li_2O and has the highest lithium content of economic minerals. The presence of fluorine and alumina in this mineral is also beneficial in glass production but the high phosphate content has limited the use of amblygonite to producing opacity in certain glassware. Large deposits of amblygonite, moreover, are rare, and the mineral has a limited availability.

Petalite $LiAl(Si_2O_3)_2$ contains 2 - 4 per cent Li_2O and is used as a concentrate in the glass industry. The iron content of petalite ores is generally low and the mineral contains no interfering elements detrimental to the manufacture of glass. Petalite is available in commercial quantities being extensively mined in Southern Rhodesia.

Lepidolite $Al_2O_3/3SiO_2/2K\ LiF$ contains 3 - 4 per cent Li_2O and is largely used in glass-making, particularly in the U.S.A. Most of the lepidolite is used directly in the manufacture of flint, opal and heat-resisting borasilicate glasses such as Pyrex ware. Supplies of lepidolite are readily available, deposits being mined in Southern Rhodesia, South West Africa and Mozambique.

The use of lithium in glass is steadily growing but lithium minerals have certain disadvantages in competing with chemically pure lithium carbonate. The lithium content of lepidolite and petalite, the two minerals commonly used, is low and the ratio of alumina to lithium content is high. Consequently, a large quantity of mineral has to be added into the batch in order to introduce relatively little lithium whilst at the same time a high alumina content is produced.

Lithium carbonate has none of these disadvantages. It typically contains 40 per cent Li_2O and slightly more than 1 per cent impurities of which the iron content accounts for only 0.0026 per cent. The carbonate is, of course, more expensive, the differential being of the order of £1 per lb. of Li_2O content.

Limestone. A wide range of commercial glasses contain between 5 per cent and 15 per cent CaO introduced as calcium carbonate. The raw material used in glass manufacture may be limestone, marble, calcite or precipitated lime. Lime increases the stability and resistance of glass and at high temperatures operates as a powerful flux.

In the U.K. very pure limestones from Buxton, in Derbyshire, are used to produce a glass grade limestone containing 99 per cent $CaCO_3$ with 0.5 per cent Si and 0.02 per cent Fe_2O_3. This is within the specification for glass container manufacture which calls for 98.5 per cent $CaCO_3$ and an iron content not exceeding 0.04 per cent. In other types of glass, lower quality limestones and dolomite containing up to 0.5 per cent iron can be tolerated. A glass grade dolomite should contain about 56 per cent $CaCO_3$ and 43 per cent $MgCO_3$.

Barium. Dense barium glasses are commonly made for optical purposes, and barium is often added to glass to improve its strength and brilliance. Barium can be introduced into the melt as precipitated barium carbonate 98 to 99 per cent pure with only 0.009 per cent Fe_2O_3 content but the minerals barytes or witherite are often used. Witherite can be concentrated to about 96 per cent barium carbonate content, a typical analysis being: $BaCO_3$ (95.8 per cent), $BaSO_4$ (2.64 per cent), $CaCO_3$ (0.17 per cent), SiO_2 (1.07 per cent), FeS_2 (0.08 per cent), $FeCO_3$ (0.07 per cent).

Finely ground barytes for glass manufacture should contain 98 per cent $BaSO_4$.

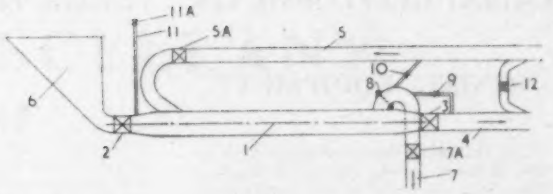
Demand For Fluorspar

Fluorspar. The addition of fluorspar to the batch improves the melting rate and this is done in the manufacture of a large range of glasses. Fluorspar is also employed in the production of opalescent glasses. Finely ground flotation concentrates containing upwards of 97 per cent CaF_2 are used for these purposes. Other fluorine compounds can be used in glass manufacture, amongst them a further mineral, cryolite. Supplies of cryolite are virtually limited to one mine at Ivigtut in Greenland and the refined product used in glass manufacture contains over 98 per cent Na_3AlF_6. Because of the limited supplies of the natural product synthetic cryolite is manufactured and used in the glass industry as well as in aluminium production.

Fluorspar remains the most economical medium for the introduction of fluorine into glass and the demand for this purpose is of importance to the fluorspar mining industry. In the U.S.A. over 30,000 tons of fluorspar are used annually in the manufacture of glass.

Borates. Borax and boric acid are found to be invaluable to the modern glass industry. Many advantages result from the addition of sufficient borax to a soda-lime batch to give about 1 per cent B_2O_3 in the finished glass. Glass oven-ware contains up to 12 per cent boric acid and it is to this that the reduced expansion on subjection to heat is due. Glasses are improved in strength through the addition of boric acid and miners' lamp glasses contain boric acid as a constituent for this reason. Special optical glasses contain borates of cadmium, zinc and the rare-earths and there is an increasing usage of natural hydrated sodium borate, the mineral rasorite, to introduce borates in glass manufacture.

Machinery and Equipment



Feeding Hydraulic Transport Systems

One problem involved in the development of systems for hydraulic transport of coal is the injection of the coal into a high-pressure hydraulic main. This problem has been studied at the N.C.B.'s Central Engineering Establishment, Bretby, where the horizontal lock hopper feeder illustrated has been developed.

The feed of coal into the transfer chamber (*1*) is through a special hopper which is divided into two compartments, one containing a coal-and-water mix, and the other a column of relatively clear water. Delivery to the transfer chamber is so arranged that after coal ceases to flow from the coal compartment, clear water from the second compartment flushes the inlet valve (*2*) free of coarse coal before the valve is closed.

The transfer chamber (*1*) is of circular section and is long in comparison with its diameter. The inlet valve (*2*), as already stated, is linked with the feed hopper (*6*) and an outlet valve (*3*) is linked to the transport main (*4*). An extractor pipe (*7*), connected to an extractor pump, is connected to the transfer chamber by a valve (*7A*) and filter (*8*).

The return main (*5*) is connected to the chamber near the inlet end through the valve (*5A*). It is also connected to the extractor pipe through valve (*10*) to enable the filter (*8*) to be flushed. Another pipe connects the transport main with the outlet end of the chamber through valve (*9*); this is to equalize pressure on both sides of the outlet valve (*3*) as coal is to be fed into the transport main. An atmosphere valve (*11A*) reduces pressure in the chamber at the end of the charging cycle.

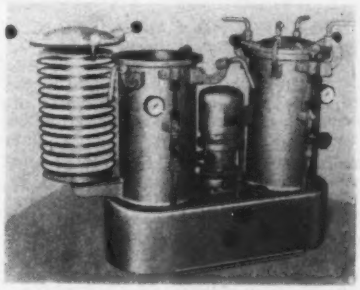
The sequence of operations is that at the commencement of the cycle the transfer chamber is full of water, the feed hopper contains coal and water, and all valves except the atmosphere valve (*11A*) are closed.

Valves *2* and *7A* are then opened, enabling the extractor pump coupled to pipe *7* to induce a fairly high rate of flow in both the transfer chamber and the feed hopper, and the charge of coal flows into the transfer chamber.

After the transfer chamber has been charged and the valve *2* flushed, the valves *2*, *7A* and *11A* are closed, and valve *9* opened, bringing the pressure in the chamber up to that of the transport main. Valves *3*, *5A* and *10* are then opened. The water flows from the return main into the chamber at the inlet end, flushing the coal out into the transport main. The opening of valve *10* enables "back-flushing to take place on the filter *8*.

ULTRA-FINE FILTRATION

All oils used in machine tools, cold-rolling mills (steel and aluminium), gear trains, hydraulic systems, centralized lubricating systems, diesel engines and turbines, are constantly subjected to an ever-increasing degree of contamination by metal abrasives, dust, swarf, oxidized



oil, and other impurities. It is recognized that the lubricating properties of such oils are not desroyed in use, but are rendered less effective by the presence of these impurities.

Some of these particles are of microscopic size. The presence of these microscopic particles necessitates frequent oil changes, causing a sharp increase in costs. The continuous filtration of mineral oils, as well as washing and cleaning agents like trichlorethylene, perchlorethylene, benzine, etc., to remove not only the large sized particles, but also those of microscopic size, is thus essential both for efficiency and economy.

Specially designed for continuous ultra-fine filtration down to 2 microns, the Schlegel Models F.1 and F.2 filters are small units in relation to their output capacity and are simple and safe to operate. The Model F.1 has one filter chamber and the F.2 has two filter chambers which are mounted on a base together with an electrically driven oil-pump.

Each filter chamber is fitted with an inlet and outlet valve, flow indicator, and pressure gauge, which indicates when the filters require cleaning. A remote warning device can be supplied if required.

One particular advantage of these units is that the filter elements cannot, even after a long period, become clogged by accumulation of dirt. This is achieved by using a special Ultra Filter Aid which is added to the filter chamber. This Ultra Filter *masse* is floated on to the elements, where it forms a sponge-like covering which absorbs impurities from the liquid.

The filtering capacity per hour of the F.1 is 66 gal. and the F.2 is 132 gal.

ROTARY COMPRESSORS

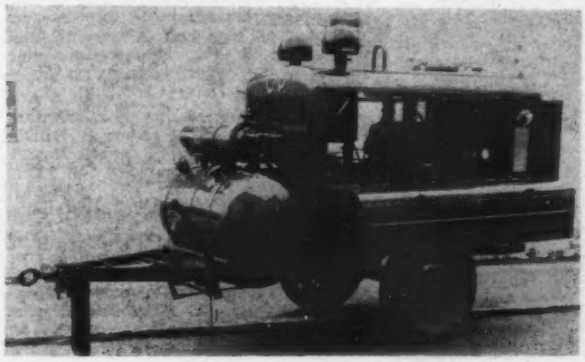
A new version of the Power Vane oil-flooded rotary compressor produced by the Consolidated Pneumatic Tool Co. is the model 120-RO-2 powered by a type 592E Ford diesel engine.

The Ford 592E 4-cylinder diesel develops 45 b.h.p. at 1,730 r.p.m. Cylinder diameter is 3.937 in. and stroke is 4.520 in., giving a swept volume of 220.35 cu. in. Compression ration is 16.1. As on other Power Vane compressors, electric starting is provided as standard.

The compressor, a two-stage unit giving a full 120 c.f.m. F.A.D. at 100 p.s.i., is driven through a flexible friction drive and is fitted with an automatic, variable-speed capacity control which varies the engine speed according to the demand for air.

The engine-cooling water is cooled in a sectionalized tubular radiator, mounted behind the compressor oil-cooler. A heavy expanded metal grille guard protects the radiators from frontal damage, whilst engine temperature control can be achieved by adjusting the opening of the three section folding doors in front of the guard.

Built-in locker compartments are provided for steels, hose, etc., and the chassis is spring-mounted on two pneumatic-tyred wheels.



Above: The N.C.B. lock hopper for hydraulic transport

Centre: The Schlegel Model F2 filter unit. On left, filter elements are removed from one chamber

Left: The CP 120-RO-2 Power Vane compressor powered by Ford 592E diesel

LATEST DEVELOPMENTS IN MINING EQUIPMENT

The following notes conclude our review of latest mining equipment developments that was begun in last week's issue.

Used by the North Range Mining Co. to fight a dangerous mine fire, solid CO_2 dropped directly into the fire area had the combined effect of reducing the temperature and excluding oxygen by means of a gaseous carbon dioxide blanket. The fire was extinguished in 18 hours and a lengthy shutdown averted.

Percussive roller cone and turbo-drilling developments are reported from the oil industry, either of which may well find an application in mining in due course.

The first of these entails the addition of percussive impact to rotary bits of the roller-cone type. According to a Russian report, such a system increased the penetration rate of a roller-cone bit in hard limestone by a factor of no less than 15. American Gulf Oil have developed a down-the-hole well drill which has quadrupled drilling speeds through hard rock. This drill incorporates a reciprocating piston powered by the drilling fluid. The cylinder is 19 ft. in length and conventional roller bits are used.

The first turbo-drill to be used in Britain is a French machine now under test in Nottinghamshire. The Russians have had such a drill for several years and the American Dresser Industries have carried out tests on the down-the-hole turbine principle in an oil well application. First indications are that penetration rates with the turbo-drill can exceed by 250 per cent those obtainable with out-of-the-hole rotary drive—but only under conditions favourable to the new method, i.e. in deep holes where bit wear is not excessive. Present designs are quite unsuited to other than exploratory application in mining.

A new design of horizontal overburden drill is reported from the Victoria openpit coal mine, Indiana. Known as the Joy 398 SB, this machine embodies vertical air-flush rotary principles, a further feature being its ability to drill to a depth of 48 ft. in one continuous run. Operated by one man, holes are drilled into an 80-ft. high bank on 20 ft. centres to prepare sufficient over-burden for removal by a 40 yd. shovel.

Use of high and low velocity explosives in adjacent holes fired with alternate millisecond delays has given good fragmentation in a tough limestone. The low velocity holes, initiated fractionally before the adjacent high velocity ones pre-stress the ground in a manner conducive to shattering.

An all-wheel direct drive system incorporating an electric motor within the hub of each wheel has been designed by Le Tourneau for rubber-tyred earth-moving equipment. This system has already been proved in large scale cross-country transport equipment, both military and industrial, but its application within the mining industry represents a new departure. Its importance lies in the elimination of complex power transmission trains and in provision of maximum tractive effort. Power derives from a diesel-electric generator.

Technical Briefs

Use of Spiral Concentrators

In a general review of the use of the Humphreys spiral concentrator (*ME*, January, 1958), the author makes one very interesting point: namely, that these equipments are being used at Climax Molybdenum Co. Their application is in the by-product plant for the recovery of wolframite and cassiterite, in which most of the tungsten is finer than 200 mesh and a considerable proportion is said to be finer than 325 mesh.

This mesh is certainly very fine for spiral operation, and although each unit handles over 40 tons per 24 hours, it would be interesting to know the throughput on the section treating the finer material.

Flotation tailing is roughly classified into − 28 + 100 mesh and − 100 mesh, each size being fed to separate spirals whilst the − 100 mesh is deslimed ahead of the spirals. It would appear that success is largely due to the desliming, but nevertheless the application shows that the spiral concentrator can be used to treat markedly fine material.

UNDERGROUND GASIFICATION

Two experiments in Poland on the underground gasification of coal with the aid of oxygen have given invaluable information on this process.

Boreholes were used in these experiments, during which gas of a high calorific value (over 225 B.T.U. cu. ft. compared to 75-85 B.T.U. in Britain and the U.S.) was obtained continuously, and with about 70 per cent thermal efficiency. Subsequent inspection showed that the coal had burned away around the boreholes along the floor of the seam, to form a passage about 6 ft. wide. The seam was 3 ft. to 4 ft. thick and about 7,000 cu. ft. of oxygen were supplied.

It would appear that these tests confirm that the long-front method of gasification is unsuccessful even when oxygen is supplied. It also implies that continuous good results can only be guaranteed by placing boreholes in the seam and using oxygen.

Nevertheless, the width of the gasified zone is limited, and the spacing of the vertical boreholes must be accomplished with care.

RECOVERY OF MONAZITE

In *Ore Dressing Investigations Report* 542, published by the Commonwealth Scientific and Industrial Research Organization, Australia, it is pointed out that monazite recovery usually comprises a combination of gravity, magnetic and electrostatic separation. The interesting investigation is an attempt to show whether gravity concentration should precede dry separation or whether a preliminary concentrate of weakly magnetic material should be made, followed by tabling and final dry separation.

The order of magnetic separation and high tension separation does not seem important, but the latter can usually cope with the temperature of the feed from the driers, whereas it would require cooling before magnetic separation.

The conclusion is that, starting with a gravity method using this means to split the monazite into a top strip gave slightly better results in respect of assay and recovery. It would appear that this was largely due to the presence of tourmaline, which has roughly the same magnetic and electrical properties as monazite. When gravity concentration is employed as the first step, the other minerals present tend to push the tourmaline, with a lower specific gravity, further away from the monazite.

This is interesting, but obviously the sequence of operations must depend upon the mineral composition.

EVALUATING RARE EARTH SAMPLES

Development by the U.S. Bureau of Mines of a simple and accurate method for using X-ray equipment to analyze rare earth ores, metals, and compounds has removed a major barrier to research on a group of little-known metals of growing military and industrial importance.

The new technique makes it possible to analyze forty samples for seven elements each in a single day. By contrast, only about a dozen samples could be analyzed in a week by methods formerly used. The development thus promises to speed up the Bureau's research, aimed at finding more efficient and economical methods for separating and purifying the individual rare earths and determining their properties.

The rare earth elements are so similar that they defy conventional chemical analysis, yet knowledge of which ones are present in a given sample is essential to the Bureau's metallurgical studies of these metals.

The basis of the new technique, known as X-ray emission spectroscopy, is that every element has a characteristic, simple X-ray line spectrum. High-energy X-rays directed at a finely-ground rare earth sample cause the atoms of the sample to become excited and re-emit fluorescent X-rays, which are characteristic of the elements in the sample. In the Bureau's method, these rays strike a special crystal which reflects the characteristic line spectra of the various elements at different angles as its face is rotated.

Use of instrumentation or automation virtually eliminates the chance of human error, so that within limits the technique provides an accurate method for determining the purity and making quantitative analyses of rare earth preparations.

A copy of the report, R.I. 5378, *X-Ray Emission Spectrographic Analysis of Bastnaesite Rare Earths*, can be obtained by writing the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa. It should be identified by number and title.

MINING MISCELLANY

The extensive deposits of diamonds—bigger on average than those dug in the Belgian Congo and Ghana—found in the Yakutia area recently strengthened the belief that the whole of the Siberian plateau was diamond-bearing.

*

Deposits of uranium and thorium have been discovered in northern Greece. The discoveries are the result of the work of a team of French geologists, engaged to conduct a search for radioactive elements in Greece. After investigations lasting five months the team plotted five locations in eastern Macedonia and western Thrace.

*

A shipment of one ton of uranium valued at 29,000,000 yen has arrived at the Japan Atomic Energy Research Institute from France.

*

A French company is reported to be negotiating with the Etibank for the construction of a ferrous-chrome factory in which the latter would invest £T.3,000,000.

*

The Jones and Laughlin Steel Corporation has exercised its option to acquire a 99-year lease on the iron property of Quebec Cobalt and Exploration Ltd., located in the Mount Wright area of New Quebec, about 180 miles north of Seven Islands. Cleveland Cliffs Iron Co. is joining the enterprise as a partner. Under the lease, Quebec Cobalt receives minimum advance royalties of $50,000 yearly for two years and a minimum payment of $100,000 annually thereafter. Based on exploration by drilling and mapping, reserves are estimated at 1,000,000,000 tons of ore containing 335,000,000 tons of iron concentrates.

*

British Newfoundland Exploration, wholly owned subsidiary of British Newfoundland Corporation, has opened up high-grade uranium ore by underground development at its property near Makkovik on the Labrador coast. Values ranging from 0.62 to 0.92 per cent uranium oxide have been obtained for a length of 65 ft. Fourteen surface holes averaged 0.74 per cent uranium oxide across a true width of 6 ft. for a length of 1,100 ft.

*

Elaborate security precautions are being taken by the Chamber of Mines to protect the most costly exhibit at this year's Rand Easter Show—£1,000,000 worth of gold bars. The gold, which weighs 2¼ tons, will be displayed in 6½ ft. columns in the middle of a decorative fountain in the Chamber's pavilion.

*

Engenharia, Mineração e Metalurgia (Rio) reproduces a report, published by the U.S. Geological Service, on the uranite identified in pre-Cambrian gold-bearing conglomerates in the Cannevieras mine, Serra de Jacobina, Bahia. The mine, located 360 miles from Salvador, is a small producer, from which approximately five tons of mineral are mined daily. To confirm earlier tests of the uranium content of mining and milling products, a sampling programme was carried out during six weeks, with the following results: average grade ore, uranium percentage ranged from 0.021 to 0.055 (average, 0.03); pre-cyanidation tailings, uranium percentage, 0.012-0.018 (average, 0.015); post-cyanidation tailings, uranium percentage, 0.010-0.019 (average, 0.014). Probably much of the uranium is carried off in suspension and some in solution in the waste.

*

A Nuclear Physics Research Unit will be inaugurated this year at the University of the Witwatersrand, and before the end of the year the atom will have been split in nuclear experiments in Johannesburg. The new unit at the University has the support of a gift of £105,000, spread over seven years, from the Transvaal and Orange Free State Chamber of Mines and the De Beers group of companies.

*

Sino-Japanese talks began in Tokyo on March 25, when a Chinese steel mission arrived in Japan. Negotiations are to cover details of a long-term contract signed in Peking in February for an exchange of Japanese steel products with Chinese coal and minerals. Exchange of goods in the initial year of the contract should be worth £10,000,000 each way.

*

A Vickers Vigor tractor with torque converter and equipped with a special U-shaped coal blade, has given three demonstrations in Helsinki. At the Voikka coalyard, a 200-metre cycle is stated to have been completed in less than two minutes. In other demonstrations, the unit showed dozing capacities of 287 and 147.5 tons per hour respectively, and maintained average speeds of 2½ m.p.h. (loaded) and 5¼ m.p.h. (unloaded).

*

The Province of Natal, South Africa, is to have a new heavy industry which, when completed, will cost £12,000,000, and will export millions of pounds worth of ferro-manganese each year. It is intended to commence operations with two furnaces costing about £2,100,000, and the plant thereafter is to build up to eight furnaces over a period of fifteen years. Property to the value of £196,000 has already been acquired, and options have been taken on additional property valued at £145,000. The industry will be based at Cato Ridge, midway between Pietermaritzburg and Durban. It is estimated that the new industry will eventually employ about 2,000 people.

*

The discovery of high-grade kaolin reserves at Kuils River, in the Cape Province, South Africa, has opened the way for an important new industry. A company has already started operations and the site that has been cleared to date is estimated to contain more than 3,000,000 tons of material. It is anticipated that within four years about £1,000,000 worth of kaolin will be mined annually.

*

Oceanic Iron Ore Co., a subsidiary of Rio Tinto of Canada, is to spend upwards of $150,000,000 to exploit medium-grade iron ore deposits in Northern Ungava for the U.K. and Continental markets. Oceanic's holdings will contain several hundred million tons of medium-grade ore deposits. Thermo-electric power will be used in processing the ore unless hydro-electric power is available by the time the company is ready to begin work. The deposits are located south of the Payne River, along the west coast of Ungava Bay in Northern Ungava. No definite date has yet been fixed to begin work in the area. Two other companies, both controlled by Mr. Cyrus Eaton, have holdings in the immediate area.

*

Duisburger Kupferhuette has begun production of zinc metal. The company started up a zinc smelting plant adjacent to its Duisburg copper works in the

Circular fluorescent dust-proof lamp fittings enclosed by shaped Perspex dishes designed to strengthen in colliery installations. The applications of Perspex were displayed at the ICI exhibition reported in our issue of March 28

middle of January last and first supplies of zinc recently became available. The rate of output will be stepped up to around 1,000 tons annually. As raw material, the company is using the zinc oxide which is a by-product from other operations. Hitherto, it has been delivered in about equal amounts to domestic and foreign firms for processing into metal. The company is selling its zinc through the Metallgesellschaft of Frankfurt-on-Main.

*

The Mining Corporation of Bolivia, which controls the mines which formerly belonged to Patino Mines, Hochschild and Aramayo Mines, has disclosed that between nationalization and the end of 1957 the decline in tin production amounted to 20.84 per cent. In 1952 production was 27,348,902 kilos, but by 1957 output had declined to 21,648,353 kilos. This year the decline will be accentuated by the restriction imposed by the International Tin Council. Total tin output in February, 1957, was 1,872,839 kilos and in the same month this year it was 1,155,308 kilos. Zinc, silver, lead, copper, bismuth and gold also show a considerable decline in output since 1952. In the past two years no antimony has been mined. Wolfram is the only metal to show an advance. In 1952 output was 1,013,622 kilos rising to 1,649,866 kilos in 1954. However, output in 1957 amounted to 1,165,305 kilos.

*

While the Ash River project on Vancouver Island is not large in terms of new hydro-electric capacity, it is one of the power plants that is already preparing the economic future of the province. Ash River will provide power to the industrial Alberni Valley. Total estimated cost of the project is $11,000,000, of which $4,200,000 was expected to be spent during the fiscal year ended March 31, 1958.

The head office of the American branch of Camp Bird Ltd. has been transferred from 70 Pine Street, New York 5, N.Y., to Suite 2110, First National Bank Building, Denver 2, Colorado.

*

The U.S. zinc industry will discuss marketing and research problems and consider plans for action at the fortieth annual meeting of the American Zinc Institute Incorporated on April 14-15, 1958, at St. Louis.

CONTRACTS AND TENDERS

The International Co-operation Administration (I.C.A.) announces the following future authorizations.

Korea

Three portable pressure-pumps, rotary type, developing water pressure up to 200 lb. p.s.i., 6.8 h.p. Three pump units, single stage, double suction, centrifugal types in capacities as listed. Project implementation order 89-52-249-6-70231. Bids to Office of Supply, Government of the Republic of Korea, Seoul. Closing date, April 25, 1958. Ref. E.S.B. 8092/58. Telephone inquiries to Chancery 4411, extension 354.

Greece

Six thousand kgs. brass ingots; 95,000 kgs. cast-iron ingots; 1,700 kgs. cast brass cylinders. Bids to State Procurement Service, 56 Panepistimiou Street, 3rd Floor, Athens. Closing date, April 16, 1958. Ref. ESB/7906/58. Telephone inquiries to Chancery 4411, extension 738 or 771.

Iceland

Lubricants and greases. Contract period, 21/1/58 to 31/7/58. Terminal delivery date, 31/1/59. Amount, $U.S.300,000. Ref. ESB/7153/58. Telephone inquiries to Chancery 4411, extension 354.

Korea

Iron and steel mill materials, ferro-alloys, mining and conveying equipment. Contract period, 13/2/58 to 31/8/58. Terminal delivery date, 28/2/59. Amount each commodity, $U.S.200,000. Ref. ESB/7153/58/ICA. Telephone inquiries to Chancery 4411, extension 354.

Korea

Non-metallic minerals and products, contract period, 28/2/58 to 30/9/58. Terminal delivery date, 31/3/59. Amount, $U.S.250,000. Non-ferrous metals and products, contract period, 28/2/58 to 31/8/58. Terminal delivery date, 31/12/58. Amount, $U.S.100,000. Tin and tin-base alloys and products; contract period, 28/2/58 to 30/9/58; terminal delivery date, 31/3/59; amount, $240,000. Zinc and zinc base alloys and products; contract period, 28/2/58 to 30/9/58; terminal delivery date, 31/3/59; amount, $U.S.100,000. Aluminium and aluminium-base alloys and products; contract period, 28/2/58 to 30/9/58 terminal delivery date, 31/3/59; amount $U.S.560,000. Ref. ESB/7153/58/ICA Telephone inquiries to Chancery 4411, extension 354.

South Africa

One front-end loader mounted on four-wheeled rubber-tyred tractor. Bucket capacity not less than 1½ cu. yd. struck. Bids to Union Tender and Supplies Board, 291 Bosman Street, P.O. Box 371, Pretoria. Closing date, April 10, 1958. Ref. ESB/7686/58. Telephone inquiries to Chancery 4411, extension 738 or 771.

Korea

Seven crawler-tractors with bulldozers. Various specifications. Bids to Office of Supply, Government of Republic of Korea, Seoul, Korea. Closing date, April 16, 1958. Ref. ESB/7855/58/ICA. Telephone inquiries to Chancery 4411, extension 354.

*

Mr. R. Salmon, managing director of J. Mann and Co. (Pvt.) Ltd., P.O. Box 1064, Bulawayo, Southern Rhodesia, will be visiting the United Kingdom from May 7 to June 6, 1958. During his visit he will be seeking agencies to be handled on a distribution basis for the Federation of Rhodesia and Nyasaland for diaphragm valves (used in mines), jet pumps (for borehole installations), mechanical handling equipment, including items such as coffin hoists, fork-lift trucks, and portable conveyors, but excluding cranes and hand winches for which existing agencies are held. Ref. ESB/7724/58. Telephone inquiries to Chancery 4411, extension 365.

*

The firm of Sondotécnica Engenharia de Solos S.A., of Avendia Presidente Vargas, 471A-22° Andar, Rio de Janeiro, have advised the British Embassy at Rio de Janeiro that they wish to get into touch with United Kingdom firms interested in exporting diamond bits for rock-drilling. They would particularly like to hear from any firms who would be prepared to consider the eventual granting of local manufacturing rights under a royalties agreement.

Manufacturers interested in this inquiry should write direct to Sondotécnica Engenharia de Solos S.A. It would be appreciated if, at the same time, they would notify the British Embassy, Commercial Department, Praia do Flamengo 284-2° Andar, Rio de Janeiro, that they have done so. Ref. ESB/5433/58. Telephone inquiries to Chancery 4411, extension 776 or 866.

Drilling operations at the Ash River project, British Columbia. Picture shows four Atlas Copco BBC 22 WK rock drills mounted on pusher legs operating on a jumbo

Metals and Minerals

Aluminium Ltd. Cuts Its Prices

The news that, as from April 1, Aluminium Ltd. was cutting its prices came as no surprise, having regard to the decline in world consumption, estimated to be about 3 per cent. As reported in our last week's issue, the Aluminum Co. of Canada—Aluminium Ltd.'s principal subsidiary—is operating at only 80 per cent of capacity because of lack of demand.

The company's selling difficulties have been aggravated by the sharp increase in exports from the U.S.S.R., particularly to the U.K., where Russian aluminium has been on offer at 1 c. to 2 c. a lb. below the 24¼ c. a lb. price of Canadian metal (say, about £182 per l.ton delivered against Aluminium Ltd.'s price of £197 per ton for ingots of minimum 99.5 per cent purity). For the past three months Aluminium Ltd. has been offering a 2 per cent "Loyalty Discount" as a means of combating Russian competition.

Imports of Russian aluminium into the U.K. rose from 197 tons in 1956 to 15,449 tons last year. This situation led Alcan to ask the Board of Trade last January to impose an anti-dumping duty on Russian imports. The request is still under consideration.

Alcan has reduced its Canadian price for 99.5 per cent metal by 2 c. a lb. to 22¼ c. The principal U.S. producers have already followed this lead. On a tonnage basis, the cut is equivalent to $40, or a little over £16. This price reduction, the first in almost a decade, follows closely on the price cuts announced by the British steel industry, for rather different reasons, which incidentally were the first for some twenty years.

The cut is, of course, very small in comparison with the declines in the prices of many other metals—e.g. copper, zinc, and lead. In this respect the aluminium industry is reaping the benefit of the policy of price stabilization which it has consistently pursued. The dictum that what goes up highest has furthest to fall appears to be particularly true of prices.

On the longer-term outlook, major aluminium producers continue to express guarded optimism and are demonstrating their confidence in the most convincing manner by pressing forward with expansion schemes. From New York comes the news that Olin Mathieson Chemical Corporation will this year raise the last $11,000,000 required for its domestic aluminium programme. Arrangements are also likely to be completed this year for capital required for Olin's participation with French, British, and Swiss interests in the development of African bauxite and alumina.

How soon the turn comes must depend partly on economic activity in the U.S. and partly on the speed at which new uses for aluminium can be developed. It is also interesting to speculate on the extent to which the fall in copper prices has restored this metal's competitive position.

M. Raoul de Vitry, vice-chairman of Péchiney, states that so far his company has not experienced any considerable decline in the demand for its main products, particularly aluminium. The company's turnover in the first two months of the year was 25 per cent higher than in the corresponding period of 1957. For the whole of this year it is expected at least to equal the progress made in 1957. The recent increases in the price of aluminium in France, it was added, would enable the company to pursue its investment programme, although profit margins are well below those of foreign competitors.

*

In the company's annual report, the president, Mr. N. V. Davis, reported that Aluminium Ltd. had concluded a new barter contract (subject to formal approval from the Norwegian Government) with the Government plant at Aardal of Sunndal Verk for supply to it over 20 years of 1,720,000 tons of alumina in exchange for ingot. Other barter contracts with this plant have been extended for approximately 15 years, covering an additional 1,984,000 tons.

U.S. COBALT IN 1957

Output of recoverable cobalt in the U.S. during 1957 was 1,649 s.tons, against 1,269 in the previous year, according to the Bureau of Mines, U.S. Department of the Interior. Production of cobalt metal declined by 12 per cent from the peak year 1956. The smaller output resulted chiefly from a 30 per cent decrease at the refinery of African Metals Corporation at Niagara Falls, N.Y.

Consumption in the U.S. declined to 4,578 s.tons in 1957, being 4 per cent less than in 1956 and 5 per cent below the average for the five years 1952-56. The decline in consumption resulted chiefly from a 9 per cent drop in usage of cobalt in high-temperature alloys.

Despite the smaller consumption of cobalt in the U.S. in 1957, imports increased to 8,813.5 s.tons, being a 13 per cent gain over 1956. The increase resulted chiefly from the receipt of 866 and 265 s.tons, respectively, of metal from the U.K. and Northern Rhodesia, this metal being acquired in exchange for surplus agricultural commodities.

QUICKSILVER PRICES STABLE

The London ex-warehouse price of quicksilver has now stood at £77-£78 a flask for over three weeks. The upward pressure recently discernible in the price now appears to have abated. Demand is currently described as quiet, while some metal, chiefly of Mexican origin, has arrived in the U.K. Moreover, it is understood that a few hundred flasks, chiefly Mexican, but also including Peruvian and Chilean metal, are afloat in the U.K.

Whether further quantities of Mexican quicksilver will continue to gravitate to the U.K. remains to be seen. Much depends on how the U.S. market shapes up in the near future. Metal at New York is said to be changing hands at around $235 a flask, which, excluding the import duty of nearly $20, means an origin price of almost £77 per flask. The maintenance of a firm market in New York might cause Mexican producers to sell to the U.S. instead of the U.K.

Meanwhile, both Spain and Italy continue to hold out for £80 a flask f.o.b., with offerings on a limited scale. Both countries are presumably producing at a normal rate, which, in the case of Italy, is probably between 50,000 and 60,000 flasks yearly. In 1957, Italy exported some 30,000 flasks. It is thought that a good part of Italy's production is either going into stock or to Eastern European countries. The bulk of last year's exports went to countries other than in Eastern Europe.

The U.S. Tariff Commission has formally started a fact-finding inquiry into the conditions of competition in the U.S. between quicksilver produced in the U.S. and in foreign countries.

ANTIMONY CONSUMPTION IMPROVES

Statistics issued by the British Bureau of Non-ferrous Metal Statistics show a useful recovery of U.K. consumption of antimony metal and compounds (in terms of antimony metal) during January. Total consumption rose to 435 tons from 365 tons in December. Increases were noted in oxides for white pigments, which absorbed 153 tons against 108 in December; batteries at 82 tons against 49; miscellaneous uses, 17 tons against 11; and sulphides (including crude), 7 tons against 3. Absorption in oxides for other uses than white pigments, however, fell to 100 tons in January from 109 in December.

INCREASED U.S. CHROME IMPORTS

The U.S. imported more chromite during 1957 than in any preceding year, according to the Bureau of Mines, U.S. Department of the Interior. Imports amounted to 2,312,044 s.tons, against 2,175,056 in 1956. Domestic production (shipments) of 164,746 s.tons of chromite during 1957 represented an increase of 1 per cent over the previous record established in 1953. In December, however, production totalled only 12,422 s.tons.

Production of chromium ferro-alloys and chromium metal during 1957 rose to 497,000 s.tons from 492,000 tons in 1956. December production was 40,171 tons, against 37,306 tons in November. Chromium chemicals produced during 1957 totalled 106,337 s.tons, sodium bichromate equivalent, a decrease of 12 per cent from output in 1956.

United States consumption of chromite during 1957 was 5 per cent lower than in 1956. The metallurgical industry consumed 1,177,000 s.tons of chromite ore and concentrate (47 per cent Cr_2O_3), of which 1,155,000 tons was used to make chromium ferro-alloys and metal and 22,000 for direct addition to steel. Producers of refractories consumed 428,000 tons of chromite ore and concentrate,

averaging 34.8 per cent Cr_2O_3. The chemical industry consumed 149,000 s.tons that averaged 45 per cent Cr_2O_3. This was equivalent to 1.4 tons of ore per ton of chromium chemicals produced.

Industry stocks of chromite ore and concentrate increased 32 per cent during the year.

GOLD IN H.T. ALLOYS

The increasing service temperature requirements imposed on brazed assemblies for rocket and jet engine parts, as well as for a growing variety of industrial equipment, have focused much attention on newer types of filler metals to make dependable joints in heat-resistant alloys on a production basis.

It is interesting to find that a list of filler metals surveyed by Mr. A. M. Setapen, manager of engineering of Handy and Harman, at a recent welding conference in Chicago, includes—among other materials—silver, lithium, boron and even gold alloys.

In situations where intergranular penetration of the base metal cannot be tolerated, and where high strength and excellent oxidation resistance are required at temperatures around 1,600 deg. F., there is a strong interest in gold alloys. Applications for which these gold filler metals are being considered include components for rocket motors, missiles, nuclear reactors and supersonic aircraft.

U.S. TUNGSTEN ENQUIRY

The U.S. Tariff Commission has formally started an investigation of tungsten ore and concentrates. This fact-finding inquiry will be a study "of the conditions of competition in the U.S. between tungsten ore and concentrates produced in the U.S. and in foreign countries". It was requested in a resolution adopted by the Senate Finance Committee, which asked for a report on the situation in tungsten on or before next December 1. The date for public hearings has not yet been announced.

Due to the disparity in world and domestic prices, and to the end of the U.S. Government purchase programme, almost all domestic tungsten mines are now shut down. The tungsten purchasing programme, which was put into effect in 1950, increased domestic production within two years by 50 per cent, while at the same time imports of tungsten quadrupled. The U.S. supply of tungsten is reported to be sufficient to cover five years of wartime needs. U.S. production of concentrates in 1957 was the lowest for five years at 3,350 tons.

The imposition of a U.S. tariff on imported ores and concentrates could only add to the difficulties of producers in other countries. However, December 1 is still some distance off, and much could happen to influence American thinking and policy before that date.

COPPER · TIN · LEAD · ZINC

(From Our London Metal Exchange Correspondent)

Once again there has been little major change in the prices of the four metals although the undertone for copper is very much better due to the strike at Chuquicamata, and that for tin has deteriorated considerably.

STOPPAGE AT CHUQUICAMATA

The main items of interest in the copper market have been the continued demand from Europe, the stagnation in America and the possibility of labour unrest in Chile, which came to a head on Tuesday with the stoppage at Chuquicamata which produces about 750 tons a day. It is interesting to remember that should the strike in Chile be of any duration, it will be the first major strike in a copper-producing area for over two years, and may be the forerunner of trouble elsewhere, although it is doubtful whether any strike action is likely in America under present economic conditions.

In the States, the activity on the Commodity Exchange has simmered down, but customs smelters report that fairly good business was done on a number of days which has caused them to be less anxious sellers than a fortnight ago. Against this must be balanced the report that producers' copper is moving extremely slowly. The Bureau of Mines' figures for January show that the consumption of refined copper was some 8 per cent below the monthly average for 1957 but that even in spite of this, mine and smelter output for the month was up, although the refinery output was down, showing that at the moment stocks are tending to build up in the form of unrefined metal.

In the U.K. the weekly stocks show very little change and the market has continued to fluctuate between having a backwardation and a contango. Turnover has remained satisfactory.

START OF SECOND QUOTA DEPRESSES EASTERN PRICE

The tin market has once again run into a backwardation, with the price of forward metal below the £730 which is being paid by the buffer stock manager. At this level he has had to absorb a larger tonnage last week than for some time past, and talk is once more going around about the possibility of the weight of metal becoming too great for the support to be maintained. It must, however, be borne in mind that the sharp fall in the Eastern price on Tuesday was probably due to larger offerings being made, as it was the first market day of the new quota period.

Stocks in official warehouses show an increase of about 500 tons over the previous week. The latest figures issued by the International Tin Council show that for the year 1957 there was a slight fall in the output of tin-in-concentrates from 175,500 l.tons in 1956 to 172,000 in 1957. The production of metal showed a somewhat larger fall from 177,000 to 168,000. The world consumption for tin metal reached a post-war peak in the first half of 1957. Consumption thereafter fell very steeply in the United States, although the full amount was masked to a certain extent by increases in some European countries. Although final figures are not yet available, it looks as if the final figure for the world will be below the 160,000 tons reached in 1956. On Wednesday morning the Eastern price was equivalent to £731 per ton c.i.f. Europe.

U.S. CUTS LEAD PRICE

The lead market developed a weaker undertone, and on Tuesday it became known that the U.S. price had been reduced by 1 c. per lb. to 12 c. per lb., and although most people feel that this figure can be maintained, a few pessimists are speaking of still lower levels. It is interesting to see that in spite of the cutbacks in zinc, these have had relatively little effect on that of lead, and the O.E.E.C. production in February amounted to 48,447 tonnes, which is practically the same as in the same month last year.

In Australia, however, the shorter working week introduced at Broken Hill seems to be having some effect as for the four weeks to March 8, the Zinc Corporation's production of lead concentrates was down 15 per cent, and that at New Broken Hill by 14 per cent. Demand in general seems to be slackening off somewhat, but should be helped by the advent of better weather and therefore greater activity in the building industry. Any upturn in motor car production should also be of assistance and it is believed that there are a number of sizeable orders for cables to be placed in the next few weeks.

ZINC STOCKPILING ENDS

The zinc market has remained agreeably firm in the face of an announcement by the American Administration that after the intake for March there will be no further purchases for the national stockpile. It is known, however, that cutbacks in zinc production have been fairly heavy throughout the world with the domestic production for January in the States being some 21 per cent below the figure for the same month last year, although it did show an increase over the figure for December, 1957.

The European figures were given last week, which showed no further decrease over the figures for December. In Australia for the four weeks ending March 8 the Zinc Corporation's output of zinc concentrates was down by 23 per cent and that of New Broken Hill down by 19 per cent.

Closing prices and turnovers are :

	Mar. 27		Apl. 2	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£178	£178½	£176½	£176¾
Three months ..	£177½	£178	£176¾	£177
Settlement ..	£178½		£176¾	
Week's turnover	9,950 tons		7,750 tons	
LEAD				
Current ½ month	£74½	£75	£72	£72½
Three months ..	£74¼	£75	£72	£72½
Week's turnover	3,675 tons		4,700 tons	
TIN				
Cash	£730	£730½	£730	£730½
Three months ..	£731	£731½	£722	£723
Settlement ..	£730½		£730½	
Week's turnover	1,160 tons		1,790 tons	
ZINC				
Current ½ month	£63¾	£64	£61¾	£62
Three months ..	£63¾	£64	£61½	£62
Week's turnover	4,450 tons		2,750 tons	

London Metal and Ore Prices appear on page 394.

Mining Finance

Concentration at Wankie

It was for long thought that only the stringency of transport on the railways in Rhodesia could deter Wankie Colliery from steadily raising its annual output to the plant capacity of 5,600,000 tons attained since the Anglo American Corporation took technical command. A warning note was sounded by the chairman last November. Now it is announced that the smallest of the three collieries, No. 1, is to be placed on a caretaking basis. Its capacity is 1,200,000 tons per annum.

There are two official reasons for the decision. The first is that the future demand for coal in the Federation itself is unlikely to expand, at least in the near future. This is due to the Copperbelt production cutbacks and the present "imports" of surplus power from the Belgian Congo at a somewhat lower cost. The other two collieries will be able to supply more economically the output of 4,250,000 tons per annum that is not likely to be exceeded "for a number of years".

The second reason concerns the price of coal. The company hopes that the measures it has adopted will assist in stabilizing the selling price in the Federation. This price, the statement continues, is vitally affected by the volume of coal sold under export contracts "which are becoming increasingly difficult to conclude in a highly competitive market".

Wankie, in other words, is the victim, anyway temporarily, of the change from shortages to over-supply that is attacking most mineral commodities in the world outside gold and uranium. The reference to the stabilization of the coal selling price in the Federation itself is no doubt connected with the fact that since November 1 last the average pit-head price in Southern Rhodesia has dropped by 1s. 6d. to 18s. per ton, falling 7d. on that date and a further 11d. on January 1.

It is difficult to calculate the effect of this on Wankie's profit margin in the absence of any information from the company about the result of arbitration proceedings with the government on this question that were due to start last December. As an amount of £288,000 was transferred to a special reserve in the 1956-57 accounts pending the outcome of the arbitration, it is to be hoped that the proceedings will be expedited in the light of the latest development.

Wankie is maintaining its interim for the year to August 31 next at 6d. per 10s. share. This will be on a higher capital than a year ago owing to conversions into shares at par by holders of the company's 5½ per cent first mortgage debenture stock, 1962-78. It has been the normal practice since interims were started in 1955 to pay a final that is higher than the interim. There are thus still hopes that the 1957-58 final will be maintained at 7½d. making a total of 1s. 1½d. to give a yield at 14s. (the lowest price since 1954) of 8 per cent without allowing for double-tax relief.

CHARTERED'S TAX SAVINGS

Another investment giving a similar yield but with perhaps better long-term prospects, is the 15s. stock units of the British South Africa Co. ("Chartered"). Certainly, reading between the lines of Colonel Sir T. Ellis Robins' speech at the recent annual meeting, this company looks to stand a good chance of maintaining its dividend for the year to next September at 4s. 6d. despite the lower revenue from copper royalties caused by the drop in the price of that metal.

The reason, of course, is the tax savings that are expected to accrue from the company's qualifications as an O.T.C. Sir Ellis said that on the assumption that mineral revenue would amount to £5,400,000 in a full year (against £8,760,000 in 1956-57) and that a dividend rate of 4s. 6d. was continued, then on the basis of current tax rates there should be a saving of around £1,000,000 per annum. Furthermore, there should be some recoupment in the 1956-57 accounts.

On a 4s. 6d. dividend basis the yield on Chartered at 57s. 9d. (they were over 80s. at one time last year) would be 7¾ per cent. The price could be very responsive to any continuation of the rally in copper quotations.

Extracts from the chairman's speech appear on page 391.

ALL CLEAR FOR ARISTON

The storm over the West African gold mining companies not being accepted as Overseas Trading Corporations for tax purposes because their gold is sold and refined in the U.K. (and therefore technically they do business in this country) has proved to be a brief one. It has now passed. Ariston, for instance, has modified its selling arrangements. It will thus qualify as an O.T.C. "without any doubt" from April 6 this year, the date originally chosen as most convenient.

At the meeting Major-General W. W. Richards (whose remarks appear on page 393) said that savings in profits tax per annum for this company on an assumed dividend of 30 per cent (twice the 1957-58 interim, but ignoring the 10 per cent bonus) would amount to £100,000. Stockholders can thus reasonably value their shares on a 30 per cent dividend basis (even on 1956-57 results, this could have been found from profits). At the current price of 4s., this gives them a yield of 18¾ per cent.

For a mine of this calibre this is obviously far too high. The explanation lies in the distrust that U.K. investors have for the political future of Ghana. A director of Ariston, Mr. C. J. Burns, did his best at the annual meeting to dispel any such fears. He pointed out that the government there has done everything possible to help the mines. He instanced the financial assistance that has been given for the low grade concerns. This runs until July of this year. The government is now taking advice from an independent mining expert with a view to extending the subsidy along the lines of that already in existence in Canada and Australia.

Mr. Burns thinks, quite rightly, that political opinions publicized in London have adversely affected West African share prices. This he considers to be unfortunate and "grossly exaggerated". If time proves him to be right about Ghana, Ariston stockholders could quite conceivably see the price of their holding doubled. Extracts from Mr. Burns' statement also appear on page 393.

HELP FOR "JUNGLE" MARGINALS

Mr. Burns' remarks at the Ariston meeting have special significance for another of the mines in the same group, Ghana Main Reef.

Ghana Main's difficulties have been noted in these columns on several occasion. A live management is having considerable success in stabilizing (or even reducing) costs, but the already low grade is pursuing a steady downward course. In the past it has been possible to counterbalance this, to some extent at least, by raising throughput, but full plant capacity has now been reached. The news that an independent mining expert is to investigate the position will thus be most welcome to this mine, in view of the comparatively short period remaining before the present Government grant expires.

Extracts from the circulated statement of Major-General Richards to Ghana Main Reef shareholders appear on page 393.

AMERICAN METAL ANTICLIMAX

The full report of American Metal Climax for 1957 published this week is of particular interest because it is the first since the big merger on December 30 last of the American Metal Co. with Climax Molybdenum. Moreover, there is a strong U.K. link with this American concern because it controls Rhodesian Selection Trust with a 50.61 per cent holding, has a 32.65 per cent stake in Roan Antelope and a 37.5 per cent holding in San Francisco Mines of Mexico. Other interests include Mazapil Copper (29.41 per cent), Tsumeb Corporation (28.5 per cent) and O'Okiep Copper (19.72 per cent).

Although the merger did not take place until the end of the year, the figures given are for the combined concern. Net income for 1957 was $27,895,000 equal to $1.95 per share compared with $2.68 in 1956. Dividends paid by the separate companies were equivalent to $1.20 per American Metal Climax share. The first quarterly dividend for 1958 declared in February was 30 c. Working capital on

December 31 amounted to over $82,000,000 including over $12,000,000 in cash and $38,000,000 in government and government agency securities.

The 1957 fall in profits was, of course, mainly due to the sharp decline in copper, lead and zinc prices. There was also a moderate decline in sales of molybdenum and sharply reduced sales of vanadium and tungsten. On the outlook for 1958 the glossy 52-page report confines itself to a generality. The year begins, it is stated, with almost all industrial activity in the U.S. at lower levels than in 1957. "We believe that this is a temporary adjustment in the national economy and are confident that all the metals in which your company is interested will continue to find substantial and growing use in modern life".

American Metal Climax shares stand on Wall Street at around $20½ to yield just under 6 per cent. The English equivalent price in "dummy dollars" is $36½. They are, of course, a first-class recovery stock should the American economy begin to pull out of its recession.

RAND AND O.F.S. RETURNS FOR MARCH

The adverse factors which caused such disappointing results in February were working in reverse last month, and the combination of a long month with a fractionally higher assumed price for gold meant that the March returns made an encouraging showing.

In the Anglo American group, every mine (including the declining Springs) managed to mill a higher tonnage, and record profits were the order of the day for F. S. Geduld, P. Brand, and Western Holdings. The increased earnings at the two latter mines were directly attributable to the factors mentioned above, but Geduld went one better by also forcing costs per ton down by 2s. 4d. to 78s. 10d.

The Gold Fields picture was similar, despite pressure bursts at two of the group's oldest and deepest properties—Robinson Deep and Simmer and Jack. Of the group's West Wits producers, West Drie forged further ahead, with gold and uranium profits reaching a new peak of £617,682, but Doornfontein managed only a small rise, due to a 1s. rise in costs to 61s. per ton.

Freddies Consolidated of the J.C.I. group also suffered from rising costs, and overall earnings at this mine fell back £2,000 to £3,485. Central Mining's Harmony, on the other hand, saw costs falling from 66s. to 64s. 2d. with a substantial profit increase as the result.

Elsewhere, St. Helena (Union Corporation), the present market favourite, continued its steady upward progress, while Hartebeest (Anglo-Transvaal) and Stilfontein (General Mining) both earned record sums from gold and uranium. Results at Virginia, Anglovaal's O.F.S. producer, were severely affected by an accident in the No. 1 shaft, but the loss will be recoverable under insurance.

IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY

(UNIVERSITY OF LONDON)

POST-GRADUATE COURSE IN MINING AT THE ROYAL SCHOOL OF MINES

This course will be held again in the academic year starting in October, 1958. It is primarily for metalliferous mining engineers, with several years' practical experience, who desire to broaden their knowledge of mine administration and operation. For admission an appropriate degree is normally required, but alternative qualifications will be considered. Successful students will be awarded the Diploma of the Imperial College (D.I.C.)

The course, of which certain portions will be taken at the London School of Economics, will consist of lectures and seminars. Facilities are provided for the study of Industrial and Business Administration, Mine Economics, Mine Appraisal and Reporting, together with ancillary subjects. Visits to mines and engineering works will be arranged, and one Atlas Copco Travel Scholarship to Sweden is reserved for a member of the course. The Department of Scientific and Industrial Research has accepted the course for the tenure of its Advanced Course Studentships.

The fee for the course is £64.

Applications for admission to the course should be made, preferably not later than July 1, 1958, on a form obtainable from the Registrar, Imperial College, London, S.W.7, from whom further particulars are available.

Financial News and Results

Halkyn To Close.—Due to the present depressed state of the lead market, operations at Halkyn District United Mines have become unprofitable, and mining will be suspended on April 18. Limestone operations will continue in order to retain a nucleus labour force against the time when the mine can resume production.

Final Payment From Golden Horseshoe.—The Golden Horseshoe (New) is to make its second and final liquidation distribution of 10½d. per share on April 21. The first payment amounted to 1s. 3d.

Pengkalen Capital Reorganization.—In order to simplify the present capital structure, Pengkalen Ltd., the Malayan tin producer, will hold an E.G.M. and separate class meetings on April 24 at which resolutions will be proposed converting the present preferred shares into ordinary shares at par.

Lower Selayang Profits.—Profits of Selayang Tin Dredging in the year ended September 30 last showed a sharp reduction on the previous year's results. Net profit before taxation was £18,457, a fall from £31,222, but the recommended final dividend of 20 per cent is unchanged, making a total of 25 per cent for the year against 30 per cent. Meeting, London, May 6.

Pattani Tin.—The liquidator of Pattani Tin now has £32,000 available for distribution to shareholders, equivalent to 11½d. per share. Attempts are being made to secure an offer for the shares in excess of break-up value, but, if these are unsuccessful, a first and final liquidation distribution will be made.

MARKET HIGHLIGHTS

Interest in mining markets on the Stock Exchange quietly fell away this week. Even copper shares became subdued with the rest. Not that there was any real reaction in share prices, but the few minus signs that appeared on jobbers' price lists—despite a firm metal price—caused many a worried frown in the face of a steadily declining Wall Street market. Nchanga, in which there has been a big speculative position recently, fell back 3s. 9d. to 196s. 3d. and the lower priced stocks were often a few pence down. Chartered, however, climbed 1s. to 57s. 9d. following the annual meeting and the impression gained that the 1957-8 dividend would be maintained after all.

Elsewhere, in the Rhodesian market Wankie Colliery dropped 10½d. to 14s.; this resulted from the news that a lack of expansion in coal demand had led to the closure of one of the company's collieries. This was particularly distressing in view of the fact that Wankie had for a long time past been regarded as a good growth stock.

Lead-zincs recovered after their recent setback, Consolidated Zinc regaining 1s. 3d. to 47s. 6d. The movement was not helped, however, by the later news that U.S. national stockpile purchases of zinc were to end this month together with the fall of 1 c. to 12 c. per lb. in the New York lead price.

Tins, where changed, were a few pence easier. Apart from the anticipated effects on profits of the export quota restrictions the share market was additionally concerned with the stubborn lack of response in the metal price to those restrictions. Ayer Hitam fell 1s. to 21s. 6d. and Sungei Besi lost 9d. to 12s. The market signalled its disapproval of the Pengkalen capital reorganization scheme — which seeks to put the Preferred shares on an equal basis with the Ordinary shares—by reducing the price of the Preferred by 1s. to a rather nominal 9s. 6d.

It fell to South African Gold shares to provide such brightness as there was in the mining sections. Despite the imminence of the South African general election, a steady demand continued for the older established dividend paying mines and, with not too much stock available, useful gains were scored by such issues as Crown (24s. 6d.), Consolidated Main Reef (15s.) and Robinson Deep (9s.). The movement was helped largely by the fact that the strength of the dollar gold price in London was taken to reflect precautionary switching from dollars into gold by European governments. Another bullish influence was the anticipation of some good profit returns from March operations. These hopes were later found to be well justified, particularly in the cases of Free State Geduld (79s. 4½d.), President Brand (49s. 6d.), Western Holdings (90s. 6d.), Hartebeest (58s. 9d.), and Buffelsfontein (39s. 3d.), all of which returned record profits.

Looking further into the future, there were hopes of high development values being announced in the March quarterly reports due to make their appearance in mid-April. Among shares bought in anticipation were St. Helena, which rose to an eight-year peak of 40s. 6d. on persistent Cape and London demand, and Harmony (33s. 6d.), which always responds well to a revival of interest in O.F.S. mines.

THE BRITISH SOUTH AFRICA COMPANY

FLUCTUATIONS IN COPPER PRICES AFFECT OVERALL RESULTS

CLAIM AS "OVERSEAS TRADE CORPORATION" ADMITTED

COLONEL SIR T. ELLIS ROBINS ON STRUCTURAL REORGANIZATION TO MEET POSITION

The 60th annual meeting of the British South Africa Company was held on March 27 at the Chartered Insurance Institute, 20 Aldermanbury, London, E.C.2.

Colonel Sir T. Ellis Robins, K.B.E., D.S.O. (the President), presided, and in the course of his speech, said:—

Last year my predecessor in office referred in some detail to the Rhodesia Railways Trust, in which at that time The British South Africa Company owned 81 per cent of the capital, and he explained the offer which the latter had made to acquire the remaining 19 per cent. That offer was accepted by such an overwhelming majority of the smaller shareholders that it enabled the Company to acquire the remaining capital, and the Trust has now become a wholly owned subsidiary of the Company. Its accounts are included in the Consolidated Accounts presented to you.

As mentioned in the Directors' Report, a further wholly owned subsidiary, Charter Properties (Private) Limited, was formed in Southern Rhodesia in 1957 and has already made satisfactory investments in freehold property in the Federation. Its accounts are similarly incorporated.

Mineral Revenue

It will come as no surprise to you to learn that our revenue from Mineral Royalties, after providing for the Northern Rhodesian Government's 20 per cent interest in that revenue, has dropped by some £3,500,000 as compared with the figure for the previous year. In 1956 copper averaged £316 per ton for royalty purposes. Last year the average was £220. For the first five months of the current year the average was between £161 and £162 per ton.

It must be apparent that Rhodesian copper producers have for some time past been going through a period of overproduction, which has indeed been worldwide, and that shareholders in copper companies and the Charter itself must be prepared for lean fare, which even the voluntary percentage cuts in production already announced cannot improve materially.

Copper at £400 or even £300 per ton was unhealthily high, and although the present price, hovering around in the £160's and £170's, is a little too near the margin of profitability, the industry can survive on it, and it will almost certainly have beneficial effects in bringing about more economical working and a determined effort to increase the uses of the metal.

It follows that in addition to causing a decrease in its direct mineral revenue, the depressed state of the copper market must necessarily mean smaller dividends from the producing copper-mining companies in which the Company is a substantial shareholder.

I would lay particular stress on this aspect of our affairs. Members have received a favourable dividend this year, as copper stood at a reasonably high level during the early part of 1957, thus giving a fairly good average price for the year. I feel, however, that I must repeat the words of warning uttered by my predecessor last year, that if the price of copper remains at today's level or goes lower, the Company's revenues must be adversely affected and possibly its dividend rate may have to be reviewed.

That warning may to some extent be qualified by what I have to say in a few moments.

Other Sources of Income

Against last year's drop in royalty revenue, the income from the Company's estates, investments, interest, and underwriting commissions rose by about £300,000, largely due to increased dividends from investments in gold-mining companies, interest on gilt-edged securities, and on loans to Bancroft and to the Kariba Hydro-Electric Scheme.

The total Group income for the year was £12,260,000 odd, against which must be set expenses totalling some £1,322,000. This latter figure has as an item the sum of £626,000 for amounts written off and provisions made against the depreciation in market value of certain investments. That item includes an amount of £101,000 which we have considered it prudent to write off our holding in Kansanshi Copper Mining Company Limited and one other security, a provision of £119,000 for the fall in market value of our gilt-edged and £406,000 for a similar drop in the value of the portfolio of investments held by our subsidiary, Cecil Investments Limited. The latter Company has a large holding of shares in Bancroft Mines Limited, which revealed a depreciation in market value at September 30, 1957, of £354,000.

After the deduction of expenses, the consolidated profit for the year before taxation comes to approximately £10,938,000. The taxation charged on those results is £6,088,000 odd, leaving a figure of £4,830,000 available for appropriation—some £2,180,000 less than the previous year.

Out of this figure of £4,830,000, the Directors recommend the total distribution of 4s. 6d., less income tax, per stock unit or bearer share, compared with the distribution of 5s. 3d., less income tax, which was made last year. Their recommendations in this respect will absorb an amount of £2,266,780, leaving a sum which, together with the amount of unappropriated profits at September 30, 1956, makes £4,586,559 available for further appropriation. Of this, £2,500,000 has been transferred to general reserve in order to strengthen the resources of the Company, the balance remaining unappropriated.

As to our investment portfolio, the Group's total investments at £25,670,000 show an increase of £4,220,000 when compared with the previous year. The quoted securities had a market value at September 30, 1957, of £28,117,000, showing an appreciation of £11,342,000 odd over book value. An approximate valuation of the Group's quoted investments at March 21, 1958, amounted to £23,898,000, or an appreciation over book value of £7,532,000. In addition, there was an estimated undisclosed appreciation on certain of the unquoted securities at that date of £4,300,000.

Total current assets, including British Government Securities, exceeded current liabilities, plus the proposed dividend, future taxation, and staff superannuation at September 30, 1957, by some £573,000. Capital remains unchanged and general reserve has been increased to £12,000,000 by the addition of £2,500,000, which has been appropriated out of the profits of the year.

Status as Overseas Trade Corporation Established

Some of you may have seen an announcement in the Press by the Company that it had been advised that, subject to the Directors taking certain steps, the Company's revenues from its mining and estate operations in Rhodesia should qualify for the benefits accorded to overseas trade corporations by the Finance Act, 1957. Your Directors, in consultation with their accountants and lawyers, devised certain measures which have now been carried out and which have had the effect of qualifying the Company provisionally as an "overseas trade corporation" for the purposes of the 1957 Act with effect from March 21, 1958. One of the main steps which has been taken is the formation of a new subsidiary company, "The British South Africa Company Investments Limited", for the purpose of acquiring from The British South Africa Company its securities other than those which have been acquired for permanent investment. This new subsidiary will operate in the United Kingdom as an investment dealing company.

It has also been thought convenient and desirable to form a second subsidiary, "Cecil Holdings Limited", for the purpose of acquiring certain fixed investments held by the new investment dealing company. This Company will operate in the United Kingdom as an investment trust company.

Other subsidiaries have been formed for the purpose of performing certain ancillary services for and functions of the Group. The shares of these companies will also be held by Cecil Holdings Limited.

Anticipated Benefits

The result of the reorganization should be that the Company's trading income derived from its activities in Africa (the bulk of which will consist of its mineral revenues) will be exempt from United Kingdom Income Tax and Profits Tax (subject to the proviso that the payment of dividends out of such trading income will give rise to a charge of United Kingdom Income Tax upon the gross amount of such dividends). The Group's investment income will continue to be subject to United Kingdom Income Tax and Profits Tax as heretofore. It may, nevertheless, be reasonably assumed that the various measures we have taken will result in an appreciable saving of tax, which will assist the Company in expanding and developing its overseas activities. We estimate that so long as the Company continues to qualify as an overseas trade corporation, and on the assumption that our mineral revenue will amount to £5,400,000 in a full year, and that we continue to pay a dividend of 4s. 6d. and on the basis of current rates of taxes in the United Kingdom and overseas, then our tax saving as an overseas trade corporation will be of the order of £1,000,000 per annum. Furthermore, some adjustment in the provision for taxation appearing in the accounts before you should be possible.

As I have previously indicated, the declaration of a dividend out of exempt trading income will give rise to a charge to United Kingdom Income Tax (less a credit for any Rhodesian tax paid by the Company) on the gross amount of the dividend, and this will be deducted before payment. However, shareholders resident outside the United Kingdom will be entitled to reclaim the amount so deducted, limited, however, to the net rate charged on the Company after obtaining credit for Rhodesian tax.

To that extent, therefore, the somewhat sombre picture presented by the copper market and its effect on the Company's revenues can be brightened, and it must be regarded as very satisfactory that the Company's claim to qualify as an overseas trade corporation has been admitted.

A Most Creditable Change of Heart

It has been my lot on many occasions during the past thirty years to criticize the unsympathetic attitude adopted by Governments towards companies like The British South Africa Company, who for many years—indeed for generations—have been devoting their energies and resources to developing the under-developed portions of the British Commonwealth and Empire. I must on this occasion congratulate Her Majesty's Government in the United Kingdom for the most creditable change of heart that has inspired them to bring in a practical measure which will encourage and enable companies like ours to make further resources available for this purpose.

Review of Principal Enterprises

It may be of interest to members if I refer briefly to some of the principal enterprises in the Federation with which the Company is associated.

The Rhodesian Milling and Manufacturing Company

As members will recollect, the Company has been concerned, since 1924, in the milling industry, and in partnership with Spillers Limited, has built up an extensive and successful enterprise within the Federation. The Milling Company operates eight mills situated at main centres in Southern and Northern Rhodesia, and its buying organization has for many years past been responsible for maintaining the regular supply of wheat to these territories. In spite of Government controls, which almost invariably fail to recognize the rising costs of raw materials and labour, the milling industry has maintained its position, and its policy since the war has been to plough back its profits into development to meet the requirements of a fast-growing community.

The Rhodesian Iron and Steel Company

Last year the Southern Rhodesia Government handed over to private enterprise the well-established steel works at Que Que. As a member of the consortium which acquired that concern, the Company has been allotted 250,000 shares out of a total equity capital of 2,250,000 ordinary shares of £1 each, and has undertaken to subscribe for £950,000 First Debenture Stock, carrying a right or option to subscribe at par for a further 190,000 shares. The Steel Company is at present engaged on an expansion scheme, the cost of which will exceed £8,000,000.

Rhodesian Alloys

After a very testing formative period, this refinery for ferro-chrome and allied products, in which the Company holds a substantial interest, has reached a satisfactory position. Not only is it earning reasonable profits, but it is providing a valuable outlet for Southern Rhodesia's raw materials, such as chrome ore, limestone, and coal, and it is one of the main consumers of electric power in the Federation.

Bancroft Mines

The Company has been one of the principal shareholders of Bancroft Mines Limited since the latter's formation, and has also provided substantial loans towards bringing the property into production. As shareholders will know, the directors of Bancroft, Nchanga, and Rhokana decided, in view of present market conditions, to fall into line with other major copper producers by reducing their planned production for the year beginning March, 1958, by 10 per cent. In view of the fact that on account of water difficulties and other underground problems at Bancroft, production had not yet been raised to the full capacity of the plant, production costs were higher than at Nchanga and Rhokana. It was therefore agreed that Bancroft should cease production completely for a period of one year from April 1 and confine its operations to the continuation of primary underground development and pumping at No. 1 shaft. In return, Rhokana and Nchanga will pay Bancroft a sum sufficient to cover interest on loans and the cost of this development and pumping. This arrangement will put Bancroft into a position to resume production at short notice at its full capacity and therefore at considerably lower costs than could be obtained before the mine temporarily ceased producing copper. More recently, there have also been announced arrangements for the financing of Bancroft on a more permanent basis. There is no doubt that this mine will be able to make its full contribution to the world's supply of copper.

Kansanshi Mine

This small copper property, recently flooded, has suspended operation. It is of marginal value owing to its limited extent, the complexity of its ores, and its distance from any main centre. The Company is contributing to the cost of research to determine whether de-watering and re-opening of the mine are justified.

Kariba

As you are already aware, the Company has undertaken to provide £4,000,000 by way of loan money for this important Federal Hydro-Electric Scheme, the cost of the first stage of which will be £80,000,000. It is expected that the first turbo-generator set will be commissioned for use in the early part of 1960. The total installed capacity of the scheme will be 1,200,000 kW., and it will supply both Northern and Southern Rhodesia with the major portion of their requirements for power. Its conception represents a courageous and far-sighted policy on the part of the Federal Government, in which the Company has been glad to participate.

Other enterprises in which the Company is interested are mentioned in the Report, and I draw attention to them as giving examples of the contribution which it is continuously making to the development of the Federal territories and as an indication of its confidence in the latter's future prosperity.

The report and accounts were unanimously adopted.

KONONGO GOLD MINES

The twenty fourth annual general meeting of Konongo Gold Mines, Ltd., was held on March 28 in London.

Mr. Robert Annan, M.I.M.M., Chairman, presided, and in the course of his speech, said:—Before dealing with the Accounts I should refer to a report which appeared in the Press on Wednesday last that difficulty had arisen over our claim to be qualified as an Overseas Trade Corporation. It is true that, subsequent to the issue of our report, a question was raised regarding our procedure in disposal of our output. I am glad to say that the Inland Revenue has taken an eminently fair and helpful view of the question and that the possible difficulty has been overcome.

The profit of £104,304 net available for distribution out of the year's earnings, is just more than the net amount required to cover a dividend of 6d. per share.

The Company has now qualified provisionally as an Overseas Trade Corporation as from April 6, 1957, and, as a result, it has enabled us to bring back into the Profit and Loss Account an amount of £36,000 previously provided for United Kingdom taxation and now no longer required. This is just more than the net amount required for a dividend of 2d. per share.

As an interim dividend of 2d. per share was paid on September 6, 1957, your Directors now recommend the payment of a final dividend of 6d. per share less tax, made up of 4d. out of the year's profits and 2d. out of the previous provision for taxation. Members will appreciate that the latter is a non-recurring item.

The results of development during the year were disappointing. The main Boabedroo ore-shoot has been proved down to the 15th Level. Up to the present, exposures of ore on the 16th and 17th Levels have been insignificant, though not yet conclusive.

The new ore-body first exposed on the 10th Level South has been followed upward to the 8th Level, bringing in about 36,000 tons of ore at 12 dwt. per ton, but it does not appear to persist below the 10th Level.

Since the end of the financial year the 6th Level South in the Boabedroo Section has come into ore, the last 175 ft. averaging 17.1 dwt. over 42 inches, with the end still in ore. This is encouraging as it lies above the new block between the 8th and 10th Levels to which I have already referred. The 4th Level is also being extended south into this area in the hope of proving a further upward extension of this orebody.

Beyond the next two or three years, the future of the mine is dependent on the degree of success which may result from future development. We have passed through lean periods of development before. There are still areas to be tested which may provide further reserves but we cannot escape the fact that twenty-four years of active development have decreased the opportunities still left. Our development programme is constantly under review and we shall endeavour to see that no opportunities are missed.

During the year there has been an adequate supply of labour and the turnover has been low. Labour relations have been harmonious. A further claim for increase in wages has recently been settled in negotiation between the Union and the Chamber of Mines. The increase will add approximately £600 per month to our pay roll.

ARISTON GOLD MINES

EXCELLENT RELATIONS WITH GOVERNMENT

The twenty-eighth annual general meeting of Ariston Gold Mines (1929) Ltd. was held on April 1 in London.

Major-General W. W. Richards, C.B., C.B.E., M.C., presided. The Chairman said:—Considerable comment has been made in the Press and elsewhere recently concerning mining companies operating in Ghana who may qualify for taxation purposes as an Overseas Trading Corporation. On a Revenue view, your Company was not automatically eligible for O.T.C. status as at April 6, 1957. We have consequently modified existing selling arrangements so as to qualify without any doubt as from April 6, 1958. Had we not elected to be so considered the taxation charge in respect of the year under review would probably have been some £50,000-£60,000 greater.

It will be appreciated that profits for the year ended September 30, 1956, were adversely affected by the strike which precluded any material benefit being derived from the new legislation during 1957-58. It is anticipated that savings in profits tax per annum on an assumed dividend of 30 per cent would be in the region of £100,000. Current dividend distributions have been based exclusively on the adoption of the above policy on the best advice available and in the best interests of all concerned.

The net profit for the year ended September 30, 1957, after taxation, was £244,167. The Directors recommend a final dividend of 5 per cent, making 10 per cent less tax for the year. They have also declared an Interim Dividend of 15 per cent less tax and a bonus of 10 per cent, less tax, in respect of the year ending September 30, 1958.

The total Ore Reserves at September 30, 1957, were 2,662,338 tons, averaging 6.84 dwt. over a width of 122 in.

Mr. C. J. Burns on his Visit

Mr. Burns, a director of the Company, in the course of addressing the meeting, said:—I would like to present to you a picture of your Company, its difficulties, and its achievements, and the high standard of technical efficiency of the mine's staff, also to give you an up-to-date picture of the relationship between the Ghana Government and the mining industry to correct certain misapprehensions relating to the future of British capital in Ghana and the prospects there for our mining industry generally.

From the mining angle, it must be remembered that, apart from strikes and essential maintenance, the mine does not close down, a seven-day week is the normal not the unusual. Consequently, an adequate supply of stores must be maintained to avoid the necessity of a shutdown.

Dealing with the mining techniques evolved after careful study by your management in conjunction with their technical consultants, West African Gold Corporation Ltd. and West and South African Gold Mines Ltd., it is perfectly true to say that their standards are as high as, if not higher than, the standards in other parts of Africa.

Government's Attitude

I would now like to touch briefly on the relationship between the mining industry in Ghana and the Ghana Government. Since Ghana achieved independence on March 6, 1957, numerous articles have been written in some sections of the British Press which have given rise to a belief that, politically and economically, Ghana was not a stable country. As part of the gold-mining industry, it will be quite wrong for me to discuss the political scene in Ghana: that is purely a matter for the citizens of Ghana. I do wish to emphasize most strongly, however, that within the framework of the present administration in Ghana, the gold-mining industry not only has full scope to develop unharmed by Government restriction, but in addition has received the fullest co-operation from the Government towards the peaceful settlement of wage disputes, and the Government itself has shown that it is fully aware of the difficulties experienced by low-grade mines in terms of fixed price for gold and has done all in its power to alleviate those difficulties.

It has been my privilege to negotiate with Government the terms of assistance to be given to the marginal mines. In July, 1956, Government made a grant of £200,000 to the marginal mines to cover the period from June, 1956, to July, 1958. They have now undertaken to bring out to Ghana an independent mining expert who will report to Government on the state of the gold-mining industry with a view to the passing of new legislation granting a subsidy to marginal or low-grade mines on the lines of similar legislation enacted both in Canada and Australia. This alone shows quite clearly the importance which the Ghana Government attaches to the preservation of a strong and profitable gold-mining industry. I can also say from personal experience that Government does realize the very great assistance given by the industry to the development of those areas of Ghana where the mines are situated.

Of recent time, the Mines Employees Union have shown increasing awareness of their responsibilities, and relations between the mining industry and the Union have been both cordial and co-operative. Given the industrial peace which both Government and the industry have striven so hard to establish, and which now seems assured, and a realistic price for gold, the West African gold-mining industry can, in my view, look forward to many prosperous years.

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GHANA MAIN REEF

The twenty-fourth annual general meeting of Ghana Main Reef Ltd. was held on March 31 in London.

Major General W. W. Richards, C.B., C.B.E., M.C., Chairman, presided. The following is an extract from his circulated Statement:—The year ended June 30, 1957, witnessed a most satisfactory recovery in our financial position—the debit balance of £15,584, with which we started the year, was converted into a credit balance of £61,362 by the end of the year. It is your Board's intention to rebuild and maintain the sound financial structure enjoyed by the Company prior to the 1955-56 wages dispute. For this reason, no Dividend has been recommended for the year under review.

For the current year ending June 30, 1958, we have declared an Interim Dividend of 5 per cent less Income Tax.

The available Ore Reserves at June 30, 1957, including ore in pillars, amounted to 371,201 tons, averaging 8.49 dwt. per ton, over a width of 77.0 in.

Bondaye: Development of the 20th level orebodies has met with but modest success. However, the results point to the desirability of deeper exploration; and sinking is being resumed to the 22nd level horizon.

Tuappim: Development on the 16th level, Southern Ore Shoot, proved a continuous payable length of reef for 430 ft., averaging 11.66 dwt. per ton, over a width of 121.7 in. The Northern Ore Shoot gave 170 ft., averaging 7.84 dwt. per ton, over a width of 107.3 in.

Working Costs, comprising mining, treatment and general charges, at 62s. 2d. per ton, showed a gratifying improvement.

The report and accounts were adopted.

Publications Received

L'Industrie du Diamant en 1956, by A. Moyar, is a comprehensive review of the world diamond industry in 1956, covering production, sales and distribution, the diamond-cutting industry, and industrials. A separate chapter is devoted to the illicit-diamond trade, which was estimated to have been of the order of £25,000,000 in 1956.

Mr. Moyar notes that more than 98 per cent of the diamond output comes from the African continent, where there was increased production by nearly all countries in 1956, apart from South Africa, where production was lower by 43,000 carats, and Angola, where it remained stationary. On the other hand, production from Latin America declined during the year, being 33 per cent lower for Venezuela, 9 per cent for British Guiana, and 16.5 per cent for Brazil. The book contains 181 pages and is illustrated with diagrams in colours and photographs. The publishers are Belgique Coloniale et Commerce International.

*

The Chemical Division of Armour and Co. Ltd. have published a 16-page booklet on their Arquads. This booklet dealing with the alkyl trimethyl ammonium chlorides and dialkyl dimethylammonium chlorides under the trade name of Arquads, covers a variety of applications including flotation. Such reagents are suitable where weak cationic reagents are required and are said to be especially effective in the so-called "slime range" of particles from 325 mesh to 1 micron. They are also used as emulsifiers and in some cases as flocculating agent and may

find further applications in mineral dressing.

★

The Statistical Summary of the Mineral Industry is an annual publication of statistical tables covering a period of six years, showing world production, exports and imports of all the important economic minerals and metals. This edition covers the period 1951 to 1956. In the sections on copper, lead, tin, and zinc, tables are given showing production of ore and metal. The ore tables give the metal content of the ore produced, whilst the metal tables record the amount smelted. So far as possible, the latter tables give the amount of primary metal obtained, showing separately, wherever important, production of secondary metal. Thus it is possible to see at a glance the amount of new metal available in any year.

The sections on coal and petroleum are very comprehensive, including statistics of the production and trade of by-products and refinery products. As the unit for these fuels is the same, comparison is facilitated.

Statistics for all the principal non-metallic minerals are also included. The publication is prepared by the Mineral Resources Division, Overseas Geological Surveys. Price £1 7s. 6d. net, it comprises 371 pages and is published by H.M.S.O.

★

Beerman's All Mining Year Book, 1957, comprises 426 pages including indices, maps and tabular matter. Mines are grouped under the specific metal or mineral produced. Maps include those of the Witwatersrand, Klerksdorp and OFS goldfields, as well as the coal mines of the Union. The whole is full of interesting details. A worthwhile publication.

LONDON METAL AND ORE PRICES, APRIL 2, 1958

METAL PRICES

Aluminium, 99.5%, £180 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £190 per ton
Crude (70%) £190 per ton
Ore (60%) basis 19s. 6d./20s. 6d. nom per unit, c.i.f.

Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 10s. 0d. lb.
Cerium (99% net), £13 18s. lb. delivered U.K.
Chromium, Cr. 99% 7s. 2d. lb.
Cobalt, 16s. lb.
Germanium, 99.99%, Ge. kilo lots 2s. 8d. per gram
Gold, 249s. 6d.
Iridium, £26 oz. nom.
Lanthanum (98/99%) 15s. per gram.
Manganese Metal (96% - 98%) £310
Magnesium, 2s. 5½d. lb.
Nickel, 99.5% (home trade) £600 per ton
Osmium, £20/£22 oz.
Osmiridium, nom.
Palladium, £7 10s. oz.
Platinum U.K. and Empire Refined £27 10s. oz.
Imported £23/£24
Quicksilver, £77/£78 ex-warehouse nom.
Rhodium, £40/£42 oz.
Ruthenium, £15/£18 oz. nom.
Selenium, 50s. 0d. per lb.
Silver, 76d. f. oz. spot and 75½d. f'd.
Tellurium, 15s./16s. lb.

ORES AND OXIDES

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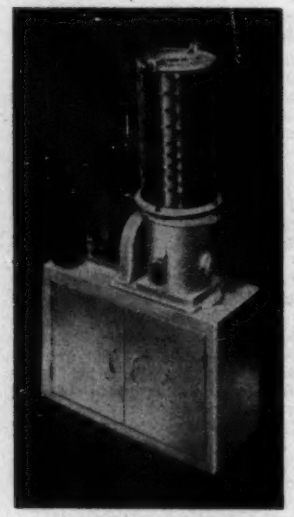
Rhodesian Metallurgical (semifriable) 48%	£17 5s. 0d. per ton c.i.f.
" Hard Lumpy 45%	£18 0s. 0d. per ton c.i.f.
" Refractory 40%	£12 5s. 0d. per ton c.i.f.
" Smalls 44%	£16 5s. 0d. per ton c.i.f.
Baluchistan 48%	£12 0s. 0d. per ton f.o.b.
Columbite, 65% combined oxides, high grade	nom.
Fluorspar—	
Acid Grade, Flotated Material	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF_2)	156s. 0d. ex works
Lithium Ore—	
Petalite min. 3½% Li_2O	47s. 6d./52s. 6d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O	47s. 6d./52s. 6d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O	£26 5s. per ton f.o.b. Beira
Magnesite, ground calcined	£28 0s./£30 0s. d/d
Magnesite Raw (ground)	£21 0s./£22 0s. d/d
Manganese Ore Indian—	
Europe (46% - 48%) basis 67s. 6d. freight	nom.
Manganese Ore (43% - 45%)	nom.
Manganese Ore (38% - 40%)	nom.
Molybdenite (85% basis)	8s. 5d. per lb. (f.o.b.)
Titanium Ore—	
Rutile 95/97% TiO_2 (prompt delivery)	£39/£40 per ton c.i.f. Aust'n
Ilmenite 52/54% TiO_2	£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)	90s. 0d./95s. 0d. per unit c.i.f.
Vanadium—	
Fused oxide 90 - 95% V_2O_5	£10 per unit c.i.f.
Zircon Sand (Australian) (65 - 66% ZrO_2)	£16 per ton c.i.f.



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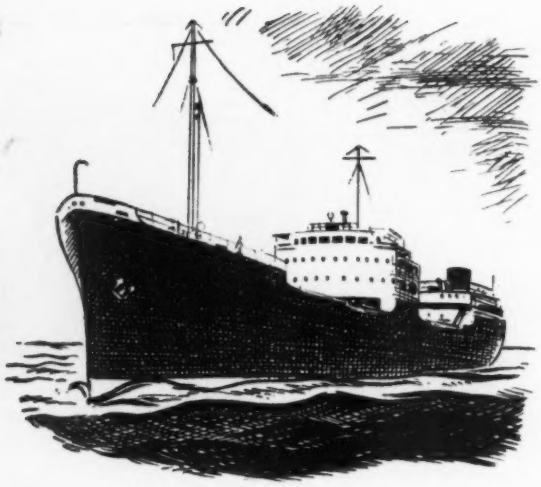

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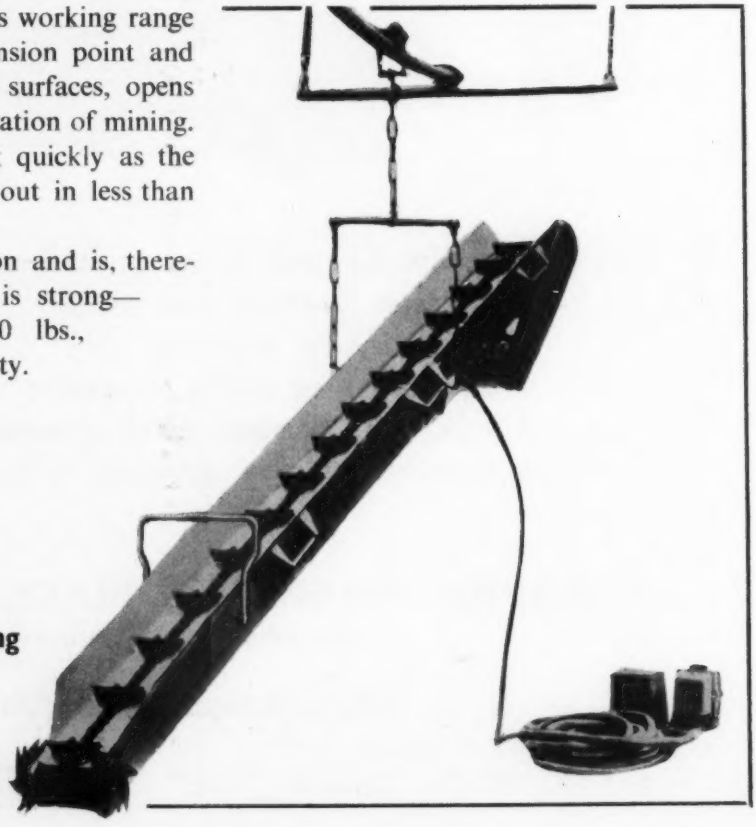

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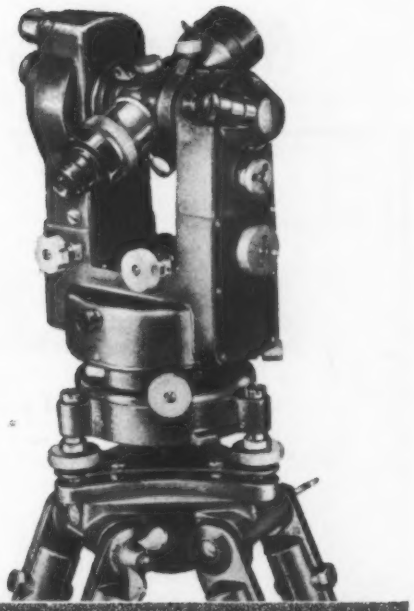

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COAL CUTTERS
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COAL PREPARATION PLANT
Birtley Engineering Ltd.
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Head Wrightson & Co. Ltd.
Pegson Ltd.

COMPRESSORS — AIR
Atlas Copco AB.
Consolidated Pneumatic Tool Co. Ltd.
Holman Bros. Ltd.
Howden (James) & Co. Ltd.
Mackay Industrial Equipment Ltd.
Ward (Thos. W.) Ltd.

CONCENTRATING TABLES
Davies Magnet Works Ltd.
Fraser & Chalmers Eng'g Wks.
Knapp & Bates Ltd.

CONCRETE MIXERS
Ransomes & Rapier Ltd.

CONVEYORS
Birtley Engineering Ltd.
Cable Belt Ltd.
Head Wrightson & Co. Ltd.
Pegson Ltd.
Wood (Hugh) & Co. Ltd.

CRANES
Ward (Thos. W.) Ltd.

CRAWLER TRACTORS
Mackay Industrial Equipment Ltd.

CRUSHERS — JAW
Fraser & Chalmers Eng'g Wks.
Hadfields Ltd.
Pegson Ltd.
Sheepbridge Eng'g Ltd.

CRUSHERS — GYRATORY
Hadfields Ltd.
Pegson Ltd.
Sheepbridge Eng'g Ltd.

CYANIDE PLANTS
Denver Equipment Co. Ltd.
Fraser & Chalmers Eng'g Wks.
Knapp & Bates Ltd.

DETONATOR BOXES
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DIAMONDS — INDUSTRIAL
Smit (J. K.) & Sons Ltd.
Van Moppes (L. M.) & Sons Ltd.

DRAGLINE BUCKETS
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Hadfields Ltd.
Ruston-Bucyrus Ltd.

DREDGE BUCKETS
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DRILL BITS — DETACHABLE
Atlas Copco AB.
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Holman Bros. Ltd.
Rip Bits Ltd.

DRILL BITS — DIAMOND
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Van Moppes (L. M.) & Sons Ltd.

DRILL RIGS
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DRILL RODS
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DRILLS — PROSPECTING
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Consolidated Pneumatic Tool Co. Ltd.
Holman Bros. Ltd.
Ruston-Bucyrus Ltd.
Wood (Hugh) & Co. Ltd.

EARTH MOVING EQUIPMENT
Blackwood Hodge (J.) & Co. Ltd.
Premier Plant & Hire Co. Ltd.
Ward (Thos. W.) Ltd.

ELECTRIC MOTOR & CONTROL GEAR
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British Thomson-Houston Co. Ltd.
General Electric Co. Ltd.
Metropolitan-Vickers Electrical Co.

ELECTRICAL SWITCHGEAR
Allen West & Co. Ltd.
British Thomson-Houston Co. Ltd.
General Electric Co. Ltd.
Metropolitan-Vickers Electrical Co.
Wood (Hugh) & Co. Ltd.

ELECTRICAL PRECIPITATION
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EXCAVATORS
Blackwood Hodge (J.) & Co. Ltd.
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Premier Plant and Hire Co. Ltd.
Ransomes & Rapier Ltd.
Ruston Bucyrus Co.

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Denver Equipment Co. Ltd.
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Huntington, Heberlein & Co. Ltd.
Knapp & Bates Ltd.

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FOUNDATIONS
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Pegson Ltd.

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HELMETS
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Holman Bros. Ltd.

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LOADERS—ROTARY DISC
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Wood (Hugh) & Co. Ltd.

LOCOMOTIVES — ELECTRIC
Greenwood & Batley Ltd.
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MAGNETIC SEPARATORS
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Cinema-Television Ltd.
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Pegson Ltd.
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PUMPS — CENTRIFUGAL
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Comet Pump & Eng'g Co. Ltd.
Fraser & Chalmers Eng'g Wks.
Pegson Ltd.
Ward (Thos. W.) Ltd.

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Denver Equipment Co. Ltd.
Fraser & Chalmers Eng'g Wks.

PUMPS — SINKING
Thom (John) Ltd.

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Siebe Gorman & Co. Ltd.

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Holman Bros. Ltd.
Wood (Hugh) & Co. Ltd.

SCRAPER LOADERS
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Joy-Sullivan Ltd.

SCREENING PLANT
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Fraser & Chalmers Eng'g Wks.
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Pegson Ltd.

SHAFT SINKING
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SURVEYING INSTRUMENTS
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TEST SIEVE VIBRATOR
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Cementation Co. Ltd.

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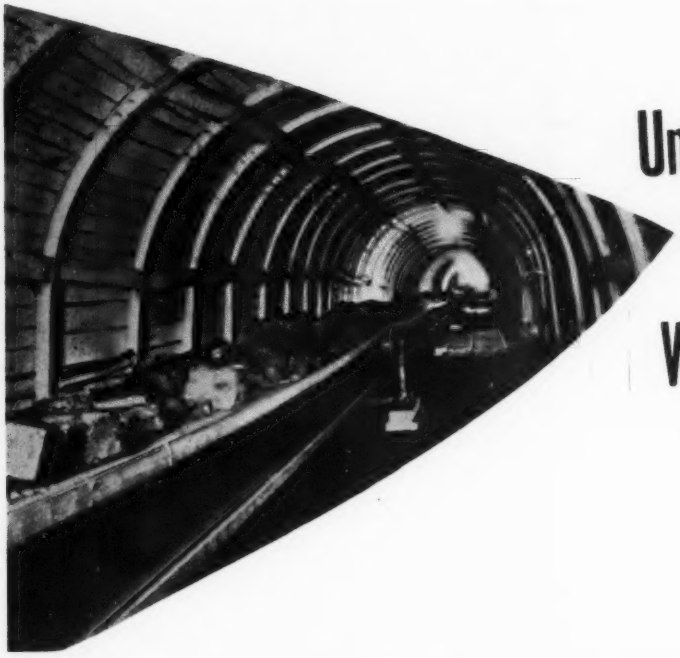
British Ropes Ltd.

WINDING EQUIPMENT — ELECTRIC
British Thomson-Houston Co. Ltd.
General Electric Co. Ltd.



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